

MACHINERY

MAY 17, 1961

ONE SHILLING & THREEPENCE

Tapershank performance...
Jobber's cost



Clarkson TaperFast System

MACHINERY
MAY 17, 1961



HiFEED serrated heavy duty milling cutters

Patent Application No. 8700,59

BRAYSHAW

TOOLS LIMITED
BELLE VUE WORKS,
MANCHESTER 12.

Phone: EASc 1046 (3 Lines)

Grams: Hardening M/C.

HiFEED serrated heavy duty cutters are designed to provide a combination of high rate of stock removal and good surface finish.

Some of the advantages to be obtained are:—

SINGLE POINT CUTTING EFFICIENCY.

REDUCED LOAD AND VIBRATION on machine and work.
INCREASED PRODUCTION, particularly on work hardening and high tensile materials.

EFFICIENT HEAT DISSIPATION resulting from the break up of the cutting edges enables **HIGHER FEEDS AND SPEEDS** to be employed.

Primarily designed for heavy stock removal HiFEED cutters produce a surface finish acceptable for most applications. An alternative design, offering similar advantages plus superior surface finish when required, is also available.

HiFEED cutters **INCREASE** production. **REDUCE** costs.

Send to-day for your copy of leaflet S.T.603.

£10,000

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PLUS

The 'know-how' which has built the most comprehensive trade broaching and spinning service in the country.

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DIAMOND WHEELS



**A NEW RANGE OFFERING
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FOR CARBIDE TOOLS

The fast, free cutting action and superlative finish they produce have been the pre-eminent qualities of Spedia Diamond Wheels since they were originally patented in 1932.

Now, after long research into diamond composition, and bonding materials and methods a new grade of wheel has been evolved with substantially improved life.

The range is described in a new catalogue now available ; Super Spedia Resin Bond Diamond Wheels, free on request.

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MANUFACTURERS OF DIAMOND WHEELS
SINCE 1932

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SPEDIA — your choice for Life !

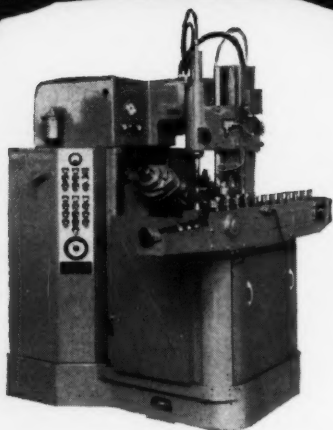
CHURCHILL use

MACHINERY

May 17, 1961

VICKERS

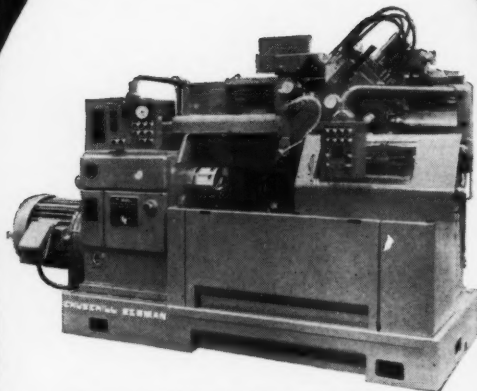
the most **ECONOMICAL** and **POSITIVE** power controls
for machine tools



The Churchill S815 Rigidhobber

A complete **VICKERS** hydraulic system is used on this machine to control movements at a definite speed and in a positive manner. The system provides:

- 1 Infeed and retraction at controlled rate to the hob head slide
- 2 Facilities for power tailstocks and tooling
- 3 Automatic loading devices



The Churchill Redman P.5 Profiling Lathe

This modern machine is fully hydraulically operated and electrically controlled by solenoid operated **VICKERS** valve units. The complete **VICKERS** hydraulic system provides:

- 1 Power chucking and tailstock operation
- 2 Carriage movement with infinitely variable feed rates
- 3 Feed slide and other various machine movements with very flexible arrangement
- 4 Profile turning slide operation
- 5 Automatic loading

The wide variety of duties which hydraulics can perform far better and at less cost than any other form of power, is well emphasised on a Link-Line of Churchill Profiling Lathes and Hobbing Machines where **VICKERS** Hydraulic Equipment is used throughout.

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May 17, 1961

Hydraulics

VICKERS — the world's most comprehensive range of hydraulic components—manufactured in Britain by **STEIN ATKINSON VICKERS**



A "Link-Line" of two Churchill Redman P.5 Profiling Lathes followed by five Churchill S815 Mark IV Rigidhobbers.

Photograph by courtesy of Charles Churchill & Co. Ltd.

STEIN ATKINSON VICKERS HYDRAULICS LTD.
197 Knightsbridge, London, S.W.7.
Telephone: **KN**ightsbridge 9641

*Technical Sales and Service at London, Glasgow
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work



Test them yourself and see the difference a truly superior blade can mean in higher speeds, greater accuracy, and flexibility which reduces breakages to a minimum.

Strict quality control at all stages of production ensures uniformity within each blade and from blade to blade.

CYCLONE

Hacksaw Blades

MANUFACTURED BY

**ENGLISH STEEL
TOOL CORPORATION LTD**

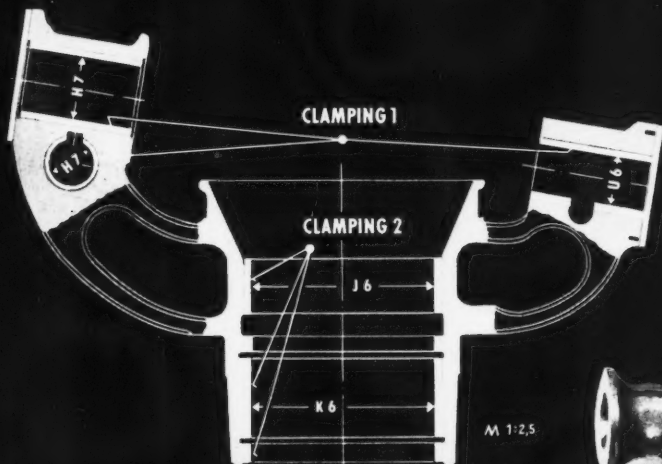
Holme Lane Works, Sheffield

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Where Efficiency Counts



Finishing in 2 automatic operations with quick change boring bars.

Floor to floor time: 5 mins.

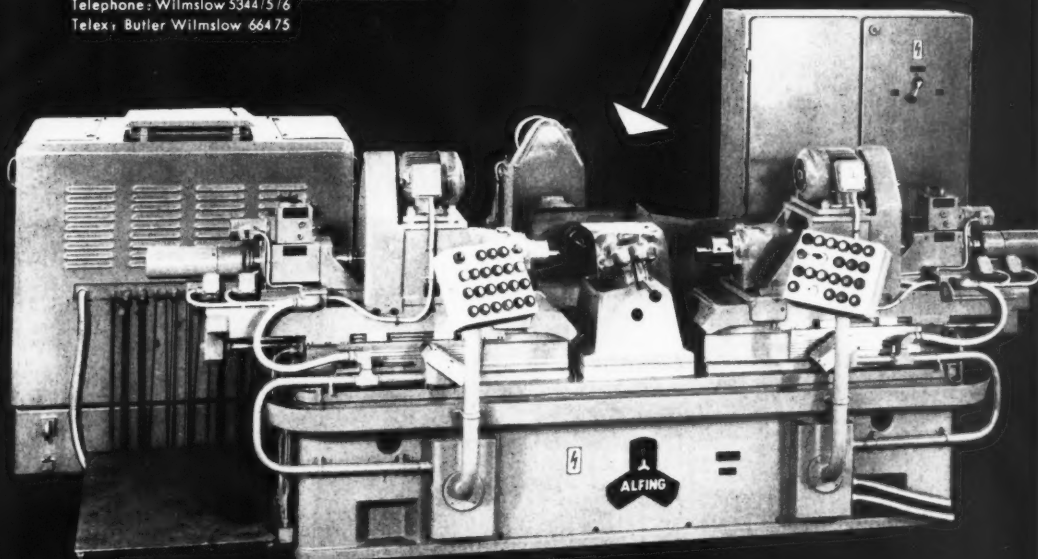
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63 A ALDERLEY ROAD WILMSLOW CHESHIRE

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**'ARCHER' Revolving
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*Increased
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at less cost
Higher speeds
Greater accuracy
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Freedom from
trouble*

'ARCHER' Dead Centres

*Precision ground to give
perfect concentricity
Tapers to standard gauges
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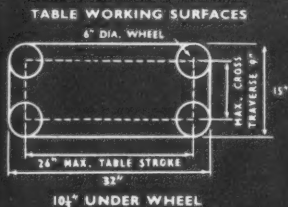
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ABWOOD

HIGH PRECISION

TOOL & DIE SURFACE GRINDER

MODEL SG-4H

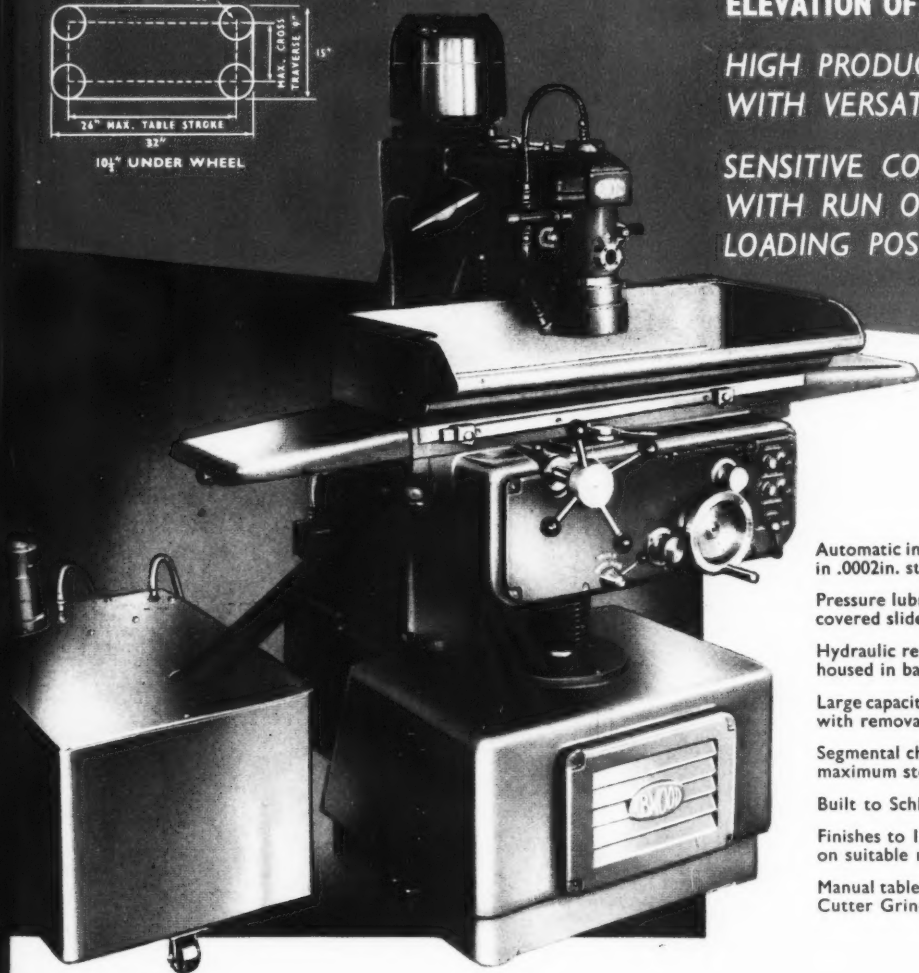


**HYDRAULICALLY
OPERATED**

**RAPID POWER
ELEVATION OF KNEE**

**HIGH PRODUCTION
WITH VERSATILITY**

**SENSITIVE CONTROLS
WITH RUN OUT TO
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Automatic in-feed for depth of cut
in .0002in. steps.

Pressure lubricated completely
covered slideways.

Hydraulic reservoir and pump
housed in base.

Large capacity mobile coolant tank
with removable sludge tray.

Segmental chuck available for
maximum stock removal.

Built to Schiesinger limits.

Finishes to 1.5 micro inches
on suitable materials.

Manual table traverse for use with
Cutter Grinding Attachment.

ABWOOD MACHINE TOOLS LTD., PRINCES ROAD, DARTFORD, KENT

Telephone: Dartford 25271 (5 lines)

Telegrams: ABWOOD DARTFORD

Test Behr-Manning Fibre Discs on your grinding job



Naturally we are confident in the quality of Behr-Manning Speed-Wet Metalite Fibre Discs. We know that they have extra "built-in" toughness. We know that the hard, sharp grit is double-anchored to the sturdy fibre backing with thermo-setting resins that are immune to heat. We know that they make quick work of the toughest grinding job. But there is only one way for *you* to find this out—try one on your own job. Fill in the coupon below and post it back to us and we will soon show just what Behr-Manning Fibre Discs can do for you.

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Marketed in the U.K. by
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NORTON and BEHR-MANNING factories also in Argentina, Australia, Brazil, Canada, France, Germany, Italy, Northern Ireland, South Africa and U.S.A.

* Trade Mark of Norton Company U.S.A.—the World's largest manufacturer of abrasive products.



Please arrange for your representative to call and demonstrate Behr-Manning Fibre Discs.

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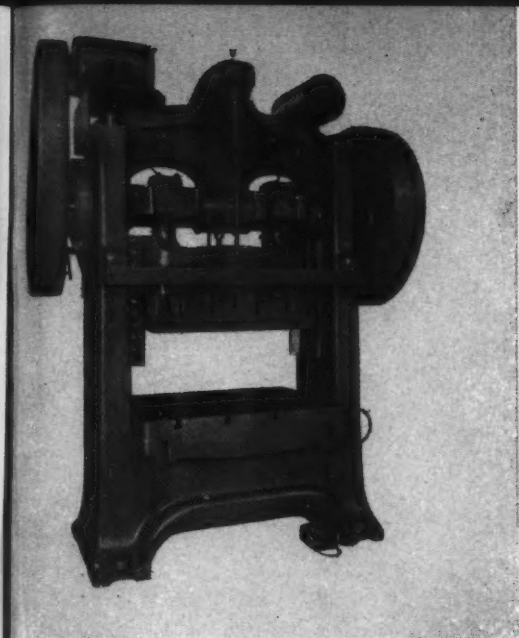


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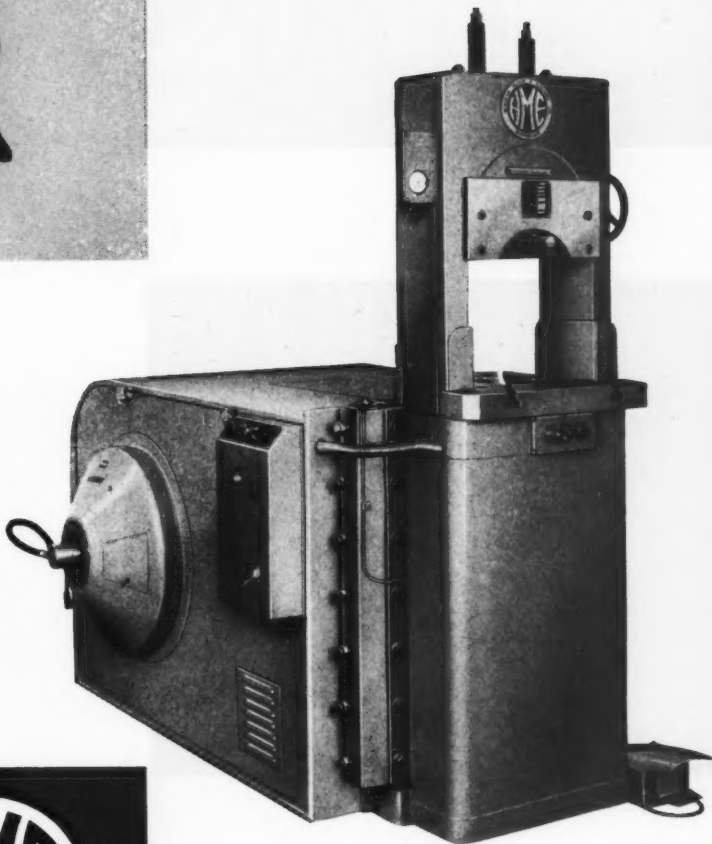
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MADE IN A COMPREHENSIVE RANGE



The wide range of H.M.E. Power Presses is the product of almost 80 years of specialised experience and covers the needs of manufacturers in every branch of Industry requiring Power Presses for blanking, piercing, raising and embossing operations. Catalogues will gladly be sent on request or should you prefer, one of our engineers will be pleased to call.



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TELEPHONE: ASHfield 1671 TELEGRAMS: AITCHEMMEE BIRMINGHAM
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MANCHESTER OFFICE: 2 ST. JOHN STREET, DEANSgate, 3. TEL: BLAckfriars 5860

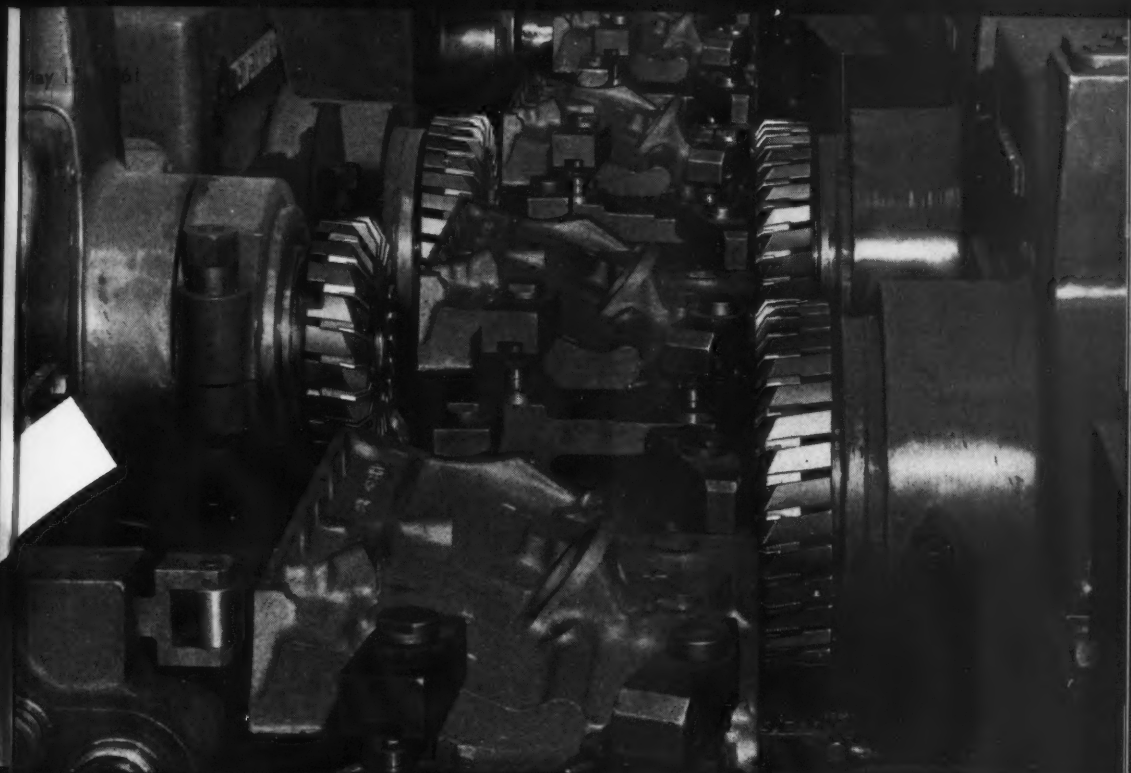


AUSTIN

MOTORS

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Galtona
TRADE MARK



SERRATED BLADE CUTTERS AND GROUND THREAD TAPS

The Austin Motor Co. Ltd., rely on GALTONA Serrated Blade Cutters and Ground Thread Taps for continuously high output and consistent tool performance.

Our illustrations show respectively, the tapping of 16 holes in Austin 7 transmission cases using GALTONA ground thread spiral flute taps, and the milling of cylinder blocks for the Austin 'B' series engine with GALTONA carbide tipped face mills.

Our tool engineers are available to assist on your own production problems.

RICHARD LLOYD LIMITED

GALTON HOUSE, ELMFIELD AVENUE, TYBURN, BIRMINGHAM, 24
Telephone: Ashfield 1801, Telegrams "Cogs, Birmingham"

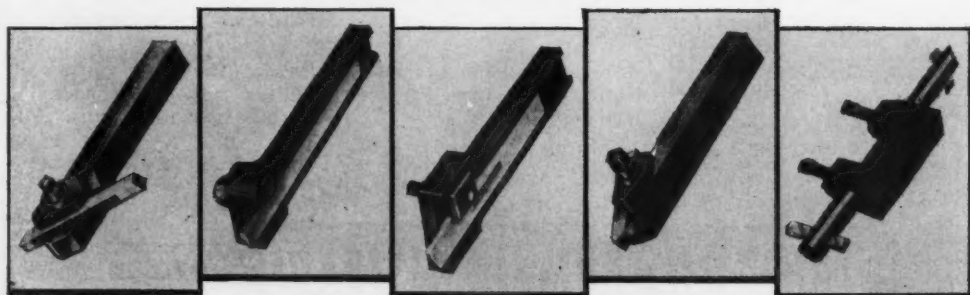
NORTHERN AREA OFFICE: Britannia House, Wellington Street, Leeds 1. Phone: Leeds 21212
LONDON AREA OFFICE: 240 Romford Road, Forest Gate, London, E.7. Phone: MARYland 7304-5.
NORTHERN IRELAND: Garage & Engineering Supplies Ltd., 78 Great Victoria Street, Belfast.
SCOTLAND: Stuart & Houston, 5 York Street, Glasgow, C.2.



tool bits, lathe tools and tool holders *with many special features*

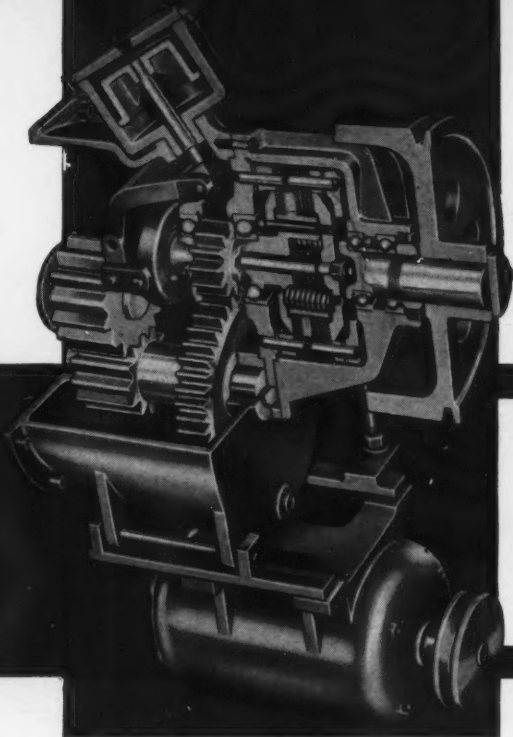
"Eclipse" tool holders are manufactured with the utmost care from high quality materials, are carefully heat treated and incorporate a number of special features which enable them to do their job superbly well.

To complete the list of tools for turning and metal cutting, there is also the extensive range of "Eclipse" tool bits and lathe tools. Made from "Eclipse" H3 cobalt High Speed Steel, these tools are carefully heat treated to give the perfect combination of hardness and toughness — tools which can be relied upon to maintain a keen cutting edge.



MADE IN

"Eclipse" hacksaw blades and other tools are made by James Neill & Co (Sheffield) Ltd., and are obtainable from all tool distributors.



Press
DOWN-TIME
CUT from days
to minutes...

with this *Unique*
INTERCHANGEABLE
DRIVE

New **BRITISH CLEARING** **TORC-PAC** **AIR CLUTCH INCLINABLES**

These new look inclinables have been designed around the revolutionary TORC-PAC sealed-in-oil drive unit which never requires adjustment. Clutch and brake maintenance is eliminated by the permanently adjusted sintered bronze friction plates. TORC-PAC drives are completely interchangeable and replacement service units which are available from stock can be fitted in less than an hour.

DRIVE UNIT GUARANTEED FOR 18 MONTHS

MOTOR, FLYWHEEL AND
 TORC-PAC DRIVE ENTIRELY
 WITHIN PRESS FRAME

CENTRALISED OIL LUBRICATION

ECCENTRIC SHAFT DRIVE

WELDED STEEL FRAMES GIVE
 BIG VARIETY OF SIZES

INCLINING ADJUSTMENT BY
 SINGLE SCREW

MINIMUM FLOOR SPACE

22, 32 & 45 TON MODELS



ROCKWELL
 MACHINE TOOL CO. LTD.

Built by **VICKERS**

WELSH HARP, EDGWARE RD., LONDON, N.W.2. TEL: GLADSTONE 0033

ALSO AT BIRMINGHAM—TEL: SPRINGFIELD 1134/5 • STOCKPORT—TEL: STOCKPORT 5241 • GLASGOW—TEL: MERRYLEE 2822

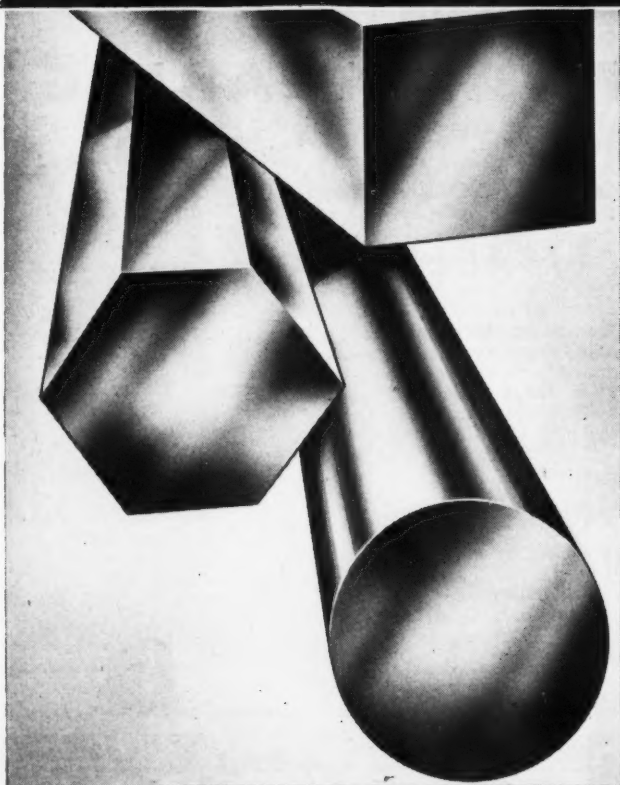


14 Machinery May 17, 1961

Coghlán



BRIGHT STEEL



MANUFACTURERS OF:

ROUND (TURNED AND DRAWN),
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AND SPECIAL SECTIONS.

MILD, FREECUTTING, CASE-
HARDENING, CARBON AND
ALLOY STEELS.

TO ANY SPECIFICATION OR
TEST.

NORMALISING, ANNEALING,
SPHEROIDISING, AND
HARDENING & TEMPERING

APPROVED BY A.I.D.,
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Tel.: Leeds 75477 (5 lines) · Telex 55184

COGLAN BRIGHT STEEL LIMITED, HUNSLET FORGE, LEEDS 10



THE INSIDE STORY

The large illustration shows, to a reduced size, a radiograph of a Ley's casting, taken in our laboratory; the smaller photograph shows the casting itself.

Our radiographic facilities enable us to conduct checks leading to the best foundry technique for producing consistently sound castings.

LEY'S MALLEABLE CASTINGS
COMPANY LIMITED
DERBY, ENGLAND,

Telephone: Derby 45671



LEY'S

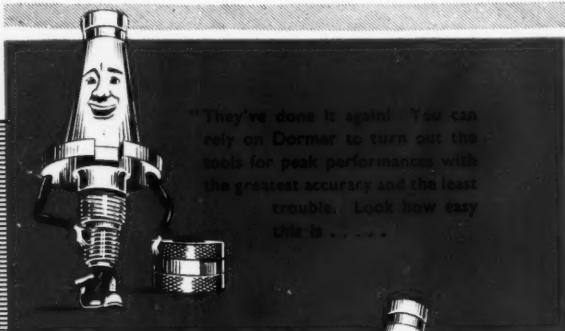
Regd. Trade Marks: 'Black Heart', 'Leys', 'Lepaz', 'Lemax'.

Screw-locked milling...

MACHINERY

May 17, 1961

**AT ITS SIMPLEST
& MOST EFFICIENT**



"They've done it again! You can rely on Dormer to turn out the tools for peak performance with the greatest accuracy and the least trouble. Look how easy this is"

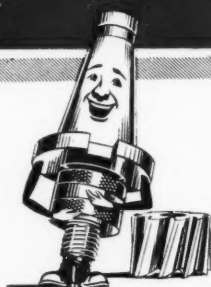
DORMER HELI-MATIC ARBORS AND SCREWED BORE CUTTERS

This high-efficiency combination simplifies screw-locked milling and achieves the greatest productivity.

Ease of assembly, precision in performance, and duration of working life, are the outstanding features of the Heli-Matic equipment.

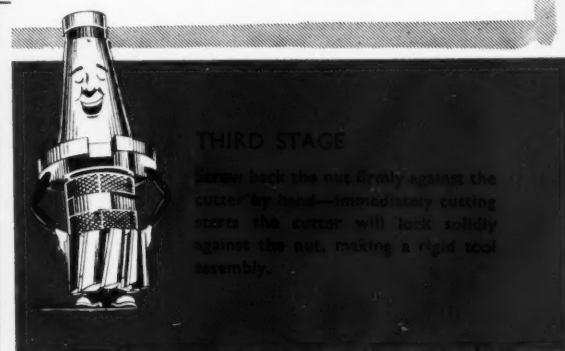
FIRST STAGE

Screw on the nut by hand
—as far as it will go.



SECOND STAGE

Screw on the cutter to meet the nut
—then release by a part reverse turn.



THIRD STAGE

Screw lock the nut firmly against the cutter by hand—immediately cutting starts the cutter will lock solidly against the nut, making a rigid tool assembly.



TO RELEASE

Apply the spanner to the nut and a few sharp hammer blows will release the nut from the cutter, which can then be screwed off by hand."

You can't go wrong—send for the Heli-Matic brochure giving the full range of Arbors and Cutters.



DORMER

Heli-matic

THE SHEFFIELD TWIST DRILL AND STEEL COMPANY LIMITED
SHEFFIELD ENGLAND

DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL ENGINEERS' MERCHANTS

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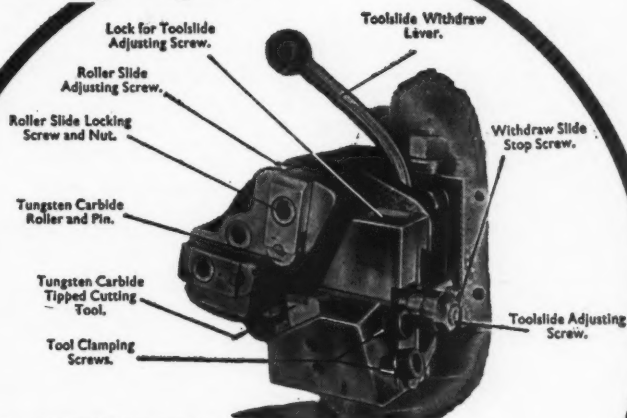
For Heavy Cuts at High Speeds

Ward

Tangential

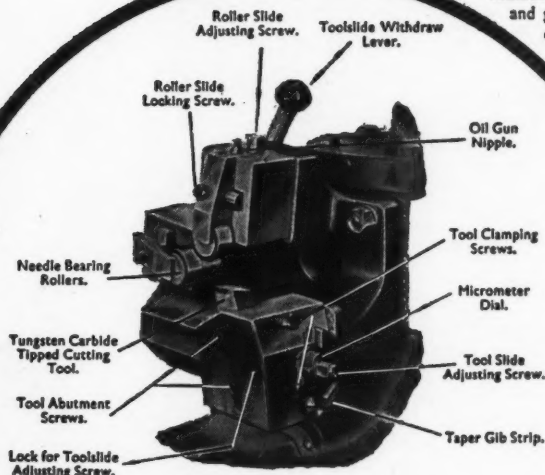
Roller Turning

Toolholders



Type of Toolholder used on Capstan Lathes

Toolholders for capstan lathes have long-life tungsten-carbide rollers and pins allowing maximum speeds to be used without danger of seizure and giving the work an excellent burnished finish.



Type of Toolholder for Turret Lathes

Toolholders for turret lathes have rollers mounted on anti-friction needle bearings and the roller slides have provision for oil gun lubrication.

Constructed for use with tungsten-carbide tools, these holders present the tool tangentially to the work in a quickly set robust slide having micrometer adjustment. Tool relief on return stroke obviates marking work.

**MOST SIZES
FROM STOCK
OR EARLY DELIVERY**

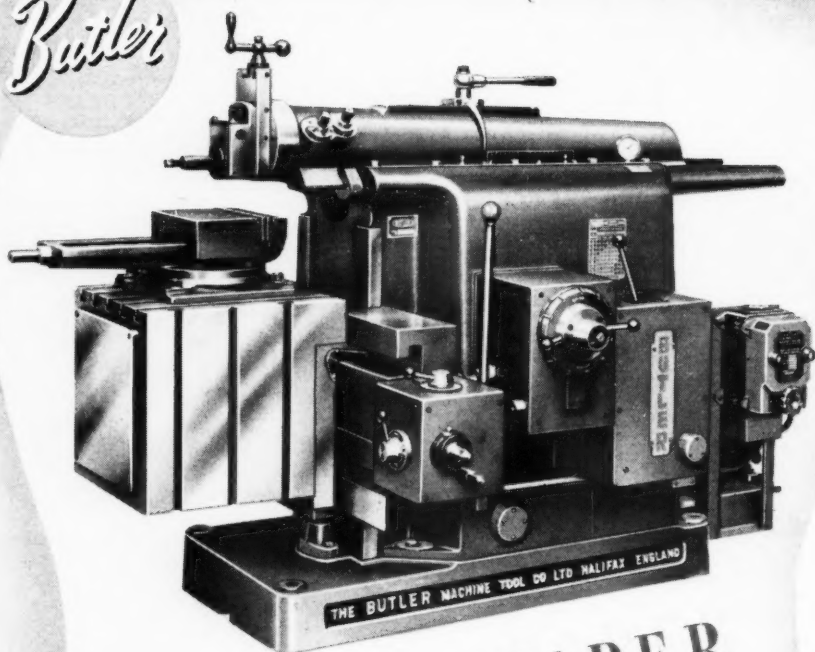


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LEAFLETS
ON APPLICATION**

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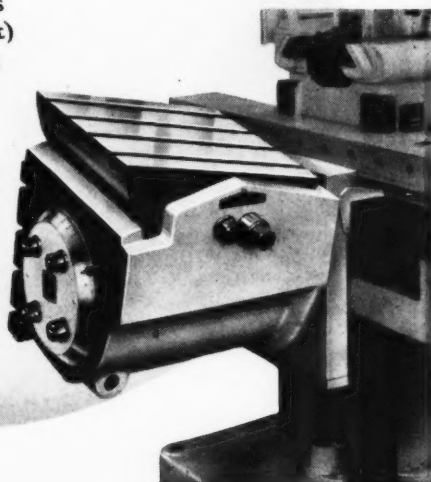
Butler



18" SUPER SHAPER

Also available with 26 in. stroke.
Special designs of swivelling or combined
swivelling and tilting tables
(shown in illustration on right)
instead of rectangular table
(seen on machine above)

The BUTLER MACHINE TOOL CO LTD
HALIFAX ENGLAND
PHONE 61841-4
PLANING, SHAPING & SLOTTING MACHINES





May 1

FOR

Cold Headed Bolts and Set Screws



Why look elsewhere, when all the benefits of long specialization plus the closest adherence to exacting quality standards are so conveniently available. Let

ORMOND quote for all Repetition Parts—for single and multi spindle automatics up to $1\frac{1}{4}$ " diameter; Brass,

Steel and Light Alloy Screws in Rolled and Cut Threads, Grub screws, Nuts, Allthreads, Hexagon

Bolts and Set screws turned from bar and Cold Headed Grades "A", "B" and High Tensile.

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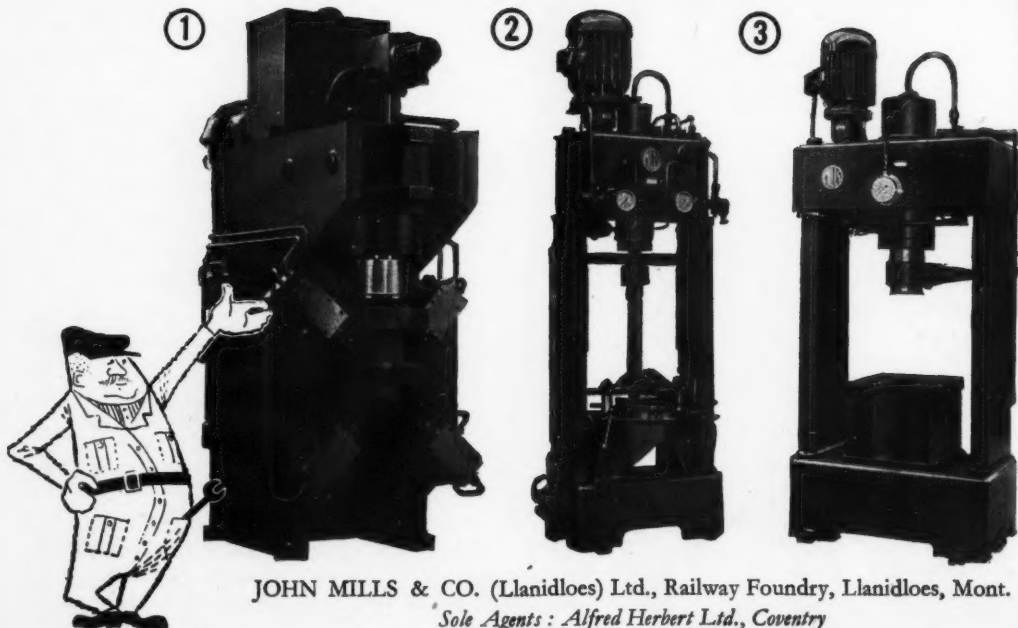
DO YOU KNOW WHAT WE'D LIKE TO SEE?

In any factory, if there's a job of work that would be done *better, quicker, cheaper*, by a Mills Oilaulic Press—we'd like to see a Mills Oilaulic Press doing it. If it was *your* factory, wouldn't you? Our design staff specialises in originating methods of manufacture and assembly to give higher productivity. Consult them now for the answer to your pressing problem.

Currently doing jobs better, quicker, cheaper are these three presses—

- ① Mills 'Oilaulic' 300-ton vertical clamp and shear press.
- ② Mills 'Oilaulic' 8-ton pull type double column broaching machine with special table and 10-ton clamping beam.
- ③ Mills 'Oilaulic' 60-ton vertical forcing press.

MILLS 'OILAU LIC' PRODUCTS



JOHN MILLS & CO. (Llanidloes) Ltd., Railway Foundry, Llanidloes, Mont.
Sole Agents: Alfred Herbert Ltd., Coventry

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Relief V
RV-06/3
Weight
Cap 16.7

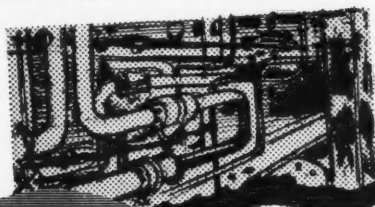
Control
DID-06
Weight
Cap 25

DENI

*HydrOILics***VALVE
News****LATEST**

DENISON VALVES

now made
in Britain!



...ter authority, and the valve is still fur
normal conditions without replaceme
...id point

Available now —

British-made Denison $\frac{3}{4}$ " Relief Valves with :—

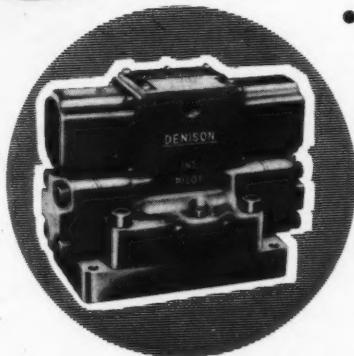
- Threaded bodies with BSP parallel threads.
- Subplate mounting type complete with sub-plates.
- Pressure control up to 5,000 p.s.i.
- Fast action eliminating over-pressures and pressure drops.
- Very low leakage rate.

British-made Denison, Solenoid Controlled, Pilot Operated $\frac{1}{4}$ " and $\frac{3}{4}$ " 4-way Valves with :—

- Five spool types.
- Built-in check valves for pilot pressure.
- Pilot adjustment choke pack.
- Oil-immersed solenoids.
- Subplates with BSP parallel threaded connections.



Relief Valve
RV-061303A.
Weight 10.5 lb.
Cap 16.7 g.p.m.



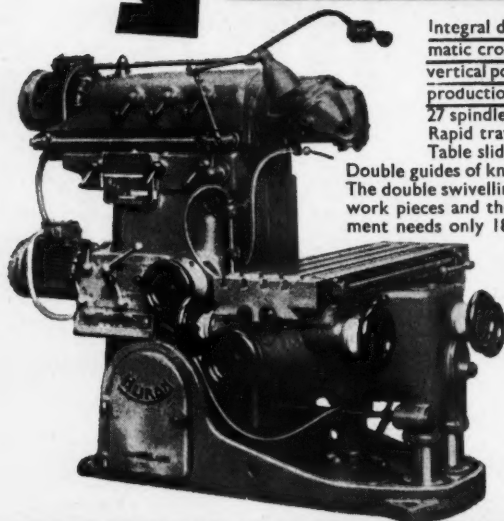
Control Valve
DID-063361CA.
Weight 30 lb.
Cap 25 g.p.m.

Denison **DERI** Limited

WRITE NOW FOR FULL INFORMATION TO :—

DENISON DERI LIMITED, VICTORIA GARDENS, BURGESS HILL, SUSSEX TEL.: BURGESS HILL 2640 & 2519

SLIDING RAM
GIVES 27½ in.
AUTO CROSS
FEED



HEAVY DUTY MILLING

ANGULAR COMPOUND HORIZONTAL VERTICAL

HURON SUPER UNIVERSAL MILLERS

Integral double swivelling universal head provided with 27½ in. automatic cross feed by the sliding ram, can be set to the horizontal or vertical position, or to any angle instantaneously—permits the heaviest production cuts. Head can be retracted completely from table line. 27 spindle speeds from 30 to 2,066 r.p.m., 27 feeds from 1/16 in. to 30 in. Rapid traverses in all directions. All operating controls duplicated. Table slides directly in the knee without cross movement or swivel.

Double guides of knee permit components in excess of 1½ tons to be machined. The double swivelling universal head requires an opening of only 14 in. to enter work pieces and the whole sliding ram with its 27½ in. automatic cross movement needs only 18 in. clearance. **OPTIONAL EXTRA FEATURES:** Mounted spacing casting assemblies providing additional 8 in. capacity under spindle. 26 in. wide 8 T-slot tables and 39½ in. automatic cross feed of sliding ram with special heavy duty knee and front operating position.

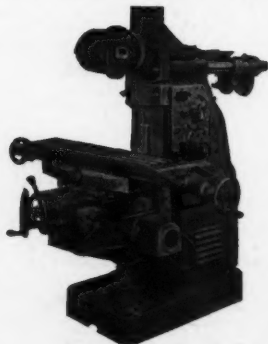
Type	Table	Automatic Feeds		
		Long	Cross	Vert.
KU4	56½ in. × 15½ in.	43½ in.	27½ in.	19½ in.
KU5	64½ in. × 15½ in.	51½ in.	27½ in.	19½ in.
KU6	78½ in. × 16½ in.	59 in.	27½ in.	19½ in.
KU55	64½ in. × 26 in.	51½ in.	38 in.	18½ in.
L83	157 in. × 59 in.	118 in.	39½ in.	59 in.

Type 'L' Open-side Traversing Head Universal Miller will mill, bore, slot and drill the largest work-pieces at one setting. The unique design permits greatest variety of operation on large work-pieces; the component remains stationary on the large work-table. Upright slides full length of base table and the sliding ram moves vertically and horizontally.

DUFOUR
UNIVERSAL
MILLERS

WITH DOUBLE UNIVERSAL SWIVELLING
HEAD, RETRACTABLE SLIDE BRACKET AND
SPACING CASTING GIVING 26 DAYLIGHT
ON No. 59 AND 21 ON No. 61

FOR ALL MODELS Direct reading dial change for speeds and feeds. All parts subject to wear hardened and ground and completely interchangeable. Built to closest tolerances. Rapid traverses in all directions. Table swivels 30°. No. 40 taper for main horizontal spindle, double swivelling universal head, dividing head and rotary table. Hardened and ground centre guide for slideways. Twin overarms. Double swivelling sliding spindle heads with speeds 53-3000 r.p.m. Double swivelling universal head on retractable slide bracket providing with 5½ in. Spacing Casting Drive assembly on 59 Machine 26 in. daylight, and 21 in. on No. 61.



MODELS 53 & 61. 16 universal head spindle speeds 21-1600 r.p.m.; 8 horizontal spindle speeds 21-1180 r.p.m.; 8 automatic feeds 1/16-18½ in. MODEL 59. 36 universal head spindle speeds 14-1780 r.p.m.; 12 horizontal spindle speeds 21-1180 r.p.m.; 16 automatic feeds 1/16-20 in. MODEL 54. Automatic cross feed of universal head 20 in.; 18 universal head spindle speeds 12-1500 r.p.m.; 36 horizontal spindle speeds 6-1500 r.p.m.; 18 automatic feeds 1/16-23½ in.

Type	Table	Automatic Feeds		
		Long	Cross	Vert.
53	43½ in. × 9½ in.	27½ in.	9½ in.	15½ in.
61	47½ in. × 10½ in.	30½ in.	9½ in.	15½ in.
59	51½ in. × 11½ in.	34½ in.	11½ in.	21½ in.
54	67 in. × 14½ in.	43½ in.	14½ in.	20½ in.

Send for full particulars of our very extensive range of these machines; ask for demonstration.

Rudolph Carne & Co. Ltd.

SWAN WORKS, FISHERS LANE,
CHISWICK, LONDON, W.4.

Telephone: CHISWICK 0514 & 6585. Inland Telegrams: RUDCAR, CHISK, LONDON. Overseas Telegrams: RUDCAR, LONDON.

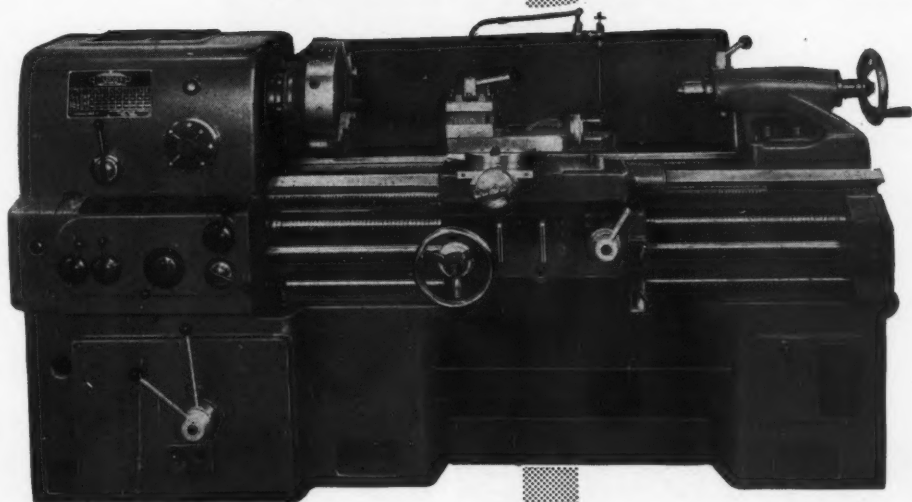
for power and precision...

the

ELLIOTT

CARDIFF

9" (18½" SWING) SS & SC LATHE



3¼" SPINDLE BORE

18	Spindle Speeds	20-1,000 r.p.m.
80	Sliding Feeds	0.0023"-0.232"
80	Surfacing Feeds	0.0009"-0.096"
56	English Threads	½-30 T.P.I.
24	Metric Threads	0.5-30mm

- Gap bed 30", 48", 80"—alternatively chip flow bed 48" and 80".
- Patented totally enclosed feed box.
- Hardened and ground gears in gearbox and headstock — all meshing faces tooth rounded for easy engagement.
- Patented snap action controls on apron — feeds can be varied whilst cutting.
- 11" (22" swing) Crusader model also available.

**ALL FEEDS AND THREADS OBTAINED
BY SINGLE LEVER SETTINGS**

Manufactured by:

B. ELLIOTT
(MACHINERY) LTD

(MEMBER of the B. ELLIOTT GROUP)

VICTORIA WORKS • WILLESDEN • LONDON • N.W.10

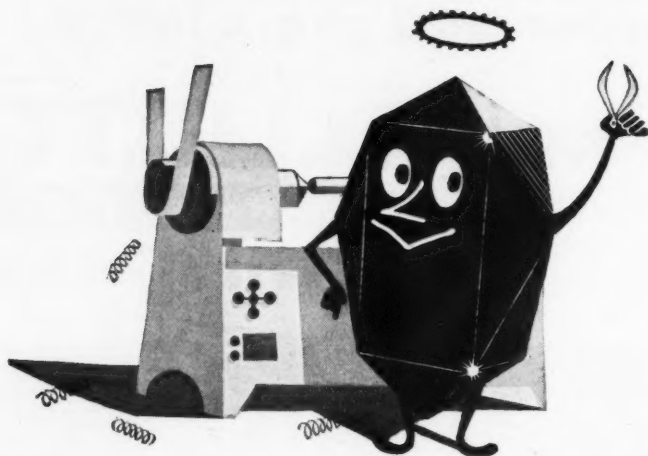
Tel: ELGAR 4050 (14 lines) Grams: Elliottana, Harles, London

Overseas Subsidiaries CANADA • U.S.A. • AUSTRALIA • S. AFRICA

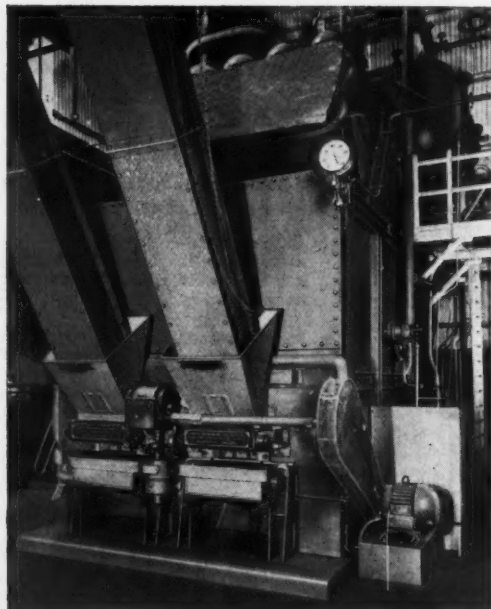


NRP 1026

When answering advertisements kindly mention MACHINERY.



COAL-properly used- is the cheapest fuel for the Light Engineering Industry



Coking stokers feed coal continuously, quietly and invisibly into this boiler.

Much of the prosperity of Britain rests upon the growing strength of the Light Engineering Industry—an industry that embraces both small workshops and the vast and complex factories employing thousands of people. Obviously, every light engineering works has to keep its products priced as keenly as possible in the face of the rising costs of labour and raw materials and economic pressures from both domestic and foreign competition. This calls for shrewd management and the sound assessment of every possible economy on a long-term basis.

BEGIN AT THE BEGINNING—THE BOILERHOUSE

There are still some industrial concerns that handicap their finances with outdated boiler-houses. To modernise other machinery while 'making-do' with inefficient boilers is to throw good money down the drain. Modern coal-burning installations can be so efficient that they will more than pay for themselves in a remarkably short time. They are, without question, the first essential in a factory that is going to make rising profits for its management.

When answering advertisements kindly mention MACHINERY.

May
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ISSU



COAL IS THE RELIABLE FUEL

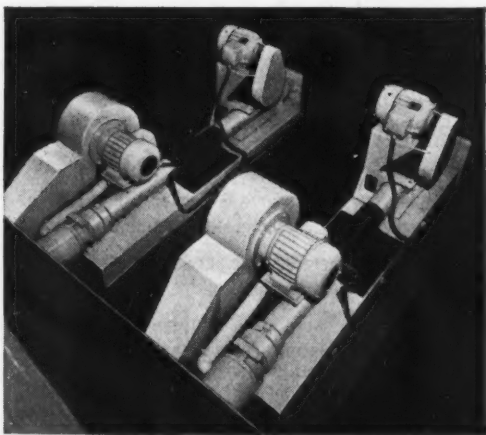
One question for any long-term planning is obvious: can supplies of coal be guaranteed? The answer is yes—without qualification. The mining industry, Britain's largest single industry, is becoming increasingly efficient; its equipment is the best of its kind. And British coalfields contain enough coal to supply every industrial demand for centuries to come.



COAL IS CLEANER, HOTTER

Modern grading and washing methods ensure that coal is the most efficient and consistent fuel for every type of boiler—the ideal fuel for every section of the light engineering industry. But to obtain the maximum heat at the lowest cost, coal should be mechanically stoked. A mechanical stoker automatically feeds the right amount of coal for the boiler load even when the load is varying; it burns coal at optimum efficiency all the time without the emission of smoke (thus complying with the regulations in Smoke Control Areas) and it virtually replaces the human element in boiler operation.

There are many types of mechanical stokers, of which the most commonly used are the Chain Grate stoker, the Coking stoker, the Underfeed stoker and the Sprinkler stoker. Standard models are available for all sizes of boiler.



Two underfeed stokers feeding coal direct from a storage hopper into a modern vertical boiler.



DELIVERY—ON THE DOT—ON THE SPOT

The delivery of industrial coal is today highly organised and completely reliable. Leading coal merchants have completely overhauled delivery and storage systems and are fully equipped to make sure that you get the right grade of coal when you want it and where you want it.

Furthermore, completely mechanised handling systems will transport coal from storage to furnace without any manual labour at all.



FINANCE PLAN FOR INDUSTRY

No deposit, repayments spread over five years, low interest charges that can be set against tax, full investment and other capital allowances that can be claimed at once; these are the terms available to the manufacturer or businessman who wants to install modern coal-burning equipment without touching his capital resources.

Make use of the National Coal Board Industrial Finance Plan. The loans are made by Forward Trust Limited, who are members of the Midland Bank Group. A 'phone call or a letter to the Regional Office of the National Coal Board will bring you full details.



AND—WHEN YOU NEED IT— A NATION-WIDE FREE SERVICE

At a flick of your finger, you can call upon one of the most comprehensive and efficient technical services in the world. Call either your coal supplier or the Regional Office of the NCB for an authoritative answer to your problem.

SOLID FUEL—more heat at less cost—and it's British

**PROGRESSIVE INDUSTRY IS
GOING FORWARD ON**

COAL

ISSUED BY THE NATIONAL COAL BOARD

When answering advertisements kindly mention MACHINERY.

**THE HOSE
THAT MAKES
ALL OTHERS
OBSOLETE**

TECALEMIT

HIGH PRESSURE NYLON HOSE

Following in the great pioneering tradition of their extruded nylon tubing, Tecalemit now proudly present a new High Pressure Hose—equalling those precision limits of Tecalemit Nylon Tubing already so well known to industry.

Tecalemit High Pressure Nylon Hose consists of:

A precision extruded flexible nylon core tube

High tenacity braiding

An outer sheath of flexible nylon tube

This structure gives the hose its characteristic pliability, with minimum inside bend radii of from 1½" to 4", according to size. Tecalemit High Pressure Nylon Hose has these advantages:

Greater durability • Higher burst pressures • Longer life • Ease of assembly • Re-usable end fittings • Clean finish and appearance

Greatly reduced wall thickness—therefore far smaller external diameters and much lighter complete assemblies. And all at highly competitive prices.

If you wish to substantiate these claims, Tecalemit will provide sample standard lengths of hose assembled with common forms of coupling, so that test rigs can be undertaken.

Tecalemit High Pressure Hose is supplied in three sizes, 1", 1½" and 2" internal diameter, to meet the needs of industry for hydraulic and pneumatic systems.

Write for full technical details of Tecalemit High Pressure Nylon Hoses and their use on hydraulic and pneumatic systems for:—

**Agricultural Machinery • Earth-moving Plant
Mechanical Handling Plant • Machine Tools**



TECALEMIT

LIMITED (SALES MT)
PLYMOUTH DEVON

1700

When answering advertisements kindly mention MACHINERY.



There's talk of Sykes in the refineries . . .

There are, in fact, a number of interesting talking points about the Sykes 3¼" gear and lubricant testing machine. Its ancestor was a machine designed by Prof. H. Blok of Delft Laboratories about twenty-five years ago. Although the capacity of the original was eventually outgrown, its principles were still good, and a larger model followed. Early in the war, the Ministry of Aircraft Production needed similar machines—re-designed and built by Sykes in co-operation with the Institute of Automobile Engineering. Since then these machines have been doing important work for Government establishments, Research Institutes and Oil Companies in various parts of the world.

Later, from the fund of knowledge gained, and to

meet the need for changed applications, Sykes produced a new and improved version which is widely used for such work as lubricant rating, checking gear performance with various types of steel; different profiles and variations of specific sliding, and for the testing of chemical treatments and metallic plating.

The test gears are expendable, being used once on each flank and then scrapped or reground. They are hardened to a very precise degree, with stringent limits laid down for the grinding of tooth form. Special gears can be designed and supplied to meet individual requirements.

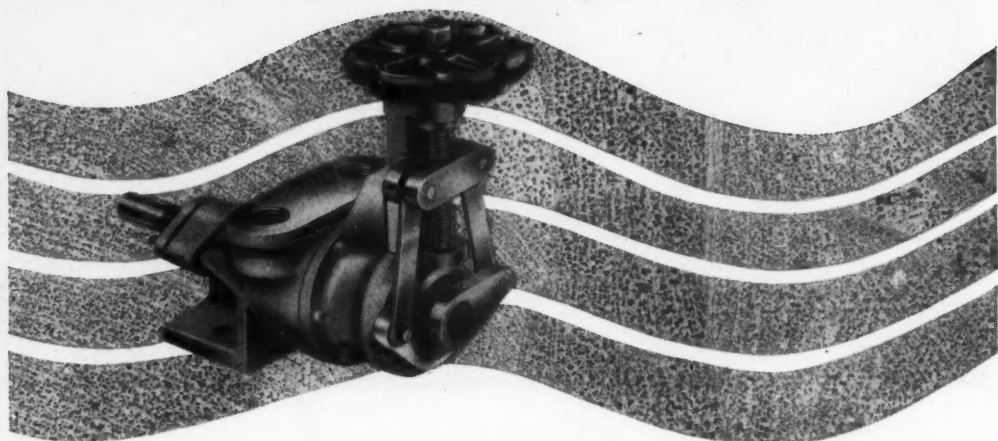
The very wide knowledge gained by Sykes through many years of practical working in this field are at the service of research and industry.

Talk to **SYKES** about gear production



W. E. SYKES LTD • STAINES • MIDDLESEX • ENGLAND and associated companies: Sykes Tool Corporation Ltd, Georgetown, Ontario, Canada
Sykes Machine & Gear Corporation, Newark, NJ, USA
W. E. Sykes Ltd, Mascot, Sydney, NSW, Australia

When answering advertisements kindly mention MACHINERY.



versatility in pumping with the Rotoplunge...

The perfect pump for use with all lubricant fluids of a non-abrasive nature which, because of its versatility, is ideal for a wide variety of industries. Long life and reliability are built into the unique construction of the Rotoplunge, which has only three moving parts. *No other range of pumps has such a wide variety of optional features.*

VARIABLE STROKE

Gives infinitely variable control over the complete range with accurate indication of the setting.

SHORT STROKE

End covers providing for reduced delivery ratios of one third and two thirds are available as an alternative to variable stroke.

AUTOREVERSE

Irrespective of the direction of the driving shaft, the autoreverse automatically maintains a uniform direction of flow.

RELIEF VALVE AND BY-PASS

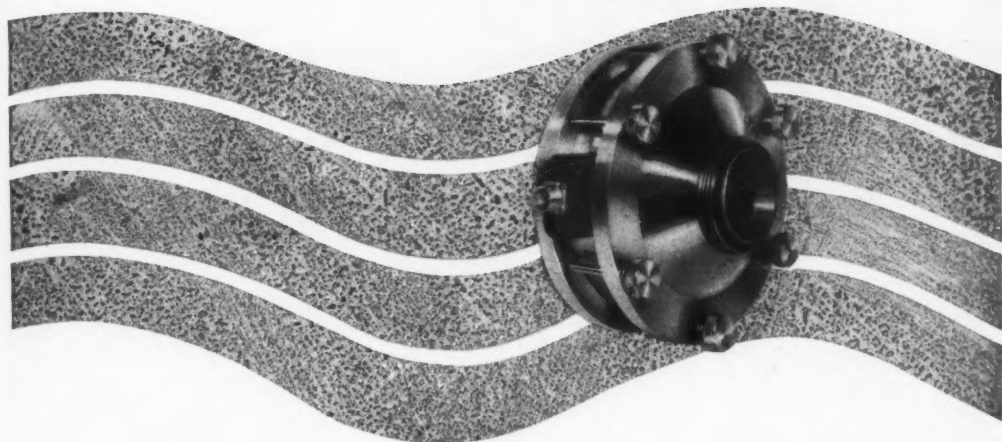
All pumps can be fitted with a relief valve and by-pass to prevent overloading of the pump or driving arrangement.

WIDE RANGE

Available in a comprehensive range from 7.5 to 2,300 gal/h. Flange or foot mounted for close-coupled or motorised sets. *The illustration shows a foot mounted Rotoplunge pump with variable delivery control.*

Write for Brochure N1/M4

When answering advertisements kindly mention **MACHINERY**.



...and in metering with the Unipulse

The finest system for accurately metering continuous flow or for batch control of liquids used in almost every industry including food, drink, chemicals, plastics and oil. It can be used as a primary measuring device for computing and read-out systems.

VARIETY OF LIQUIDS

The Unipulse will accurately indicate the rate of flow and dispense batches of liquids of differing viscosity, acidity, alkalinity and temperature.

ACCURACY

The action of the Unipulse is to electromagnetically count the revolutions of a piston, eliminating the use of gears, stuffing boxes, etc. Thus with only one moving part the Unipulse is extremely reliable at all rates of flow, with an accuracy of $\pm 0.25\%$ at a constant rate of flow which is unaffected by changes in viscosity.

EASE OF INSTALLATION

Unipulse can be easily and quickly installed into existing pipe-lines in flows ranging from 5 to 12,500 gal/h.

Write for Brochure N2/M4

PARKINSON COWAN MEASUREMENT

A division of the Parkinson Cowan Group

TAMESIDE WORKS • DOBCROSS • OLDHAM • LANCASHIRE • TELEPHONE: DELPH 424

... for cutting spur gears and splines in shafts and slots down to .014" wide, in trick cylinders the ...



GEAR & SPLINE CUTTING MACHINE

- ★ **POWERFUL DRIVE**
- ★ **EXTREMELY RIGID AND DURABLE**
- ★ **ACCURATE INDEXING MECHANISM**

Available in both Plain and Universal form, the latter having a swivelling cutter slide enabling spur or bevel gears to be cut and other angular work index milled.

Capacities	Plain	Universal
Max. diameter	36"	24"
Max. stroke of cutter slide	8"	4½"
Max. pitch, Cast Iron	5 D.P.	5 D.P.
" " Steel	6 D.P.	6 D.P.



ALFRED

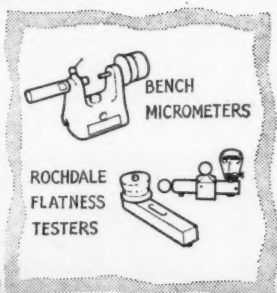
HERBERT

LTD., COVENTRY Factored Division, Red Lane Works.



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AD 549



Inspection equipment by **SIGMA**

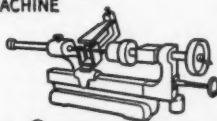


The Sigma Instrument Co. Ltd., of Letchworth in conjunction with Alfred Herbert Ltd., provide a specialised, highly efficient and comprehensive service in the field of engineering metrology.

Inspectors are welcome at both works, where all Sigma instruments can be seen in service, to discuss their problems with workshop-trained metrologists. Specialists will also visit customers' works if requested.

The Sigma range of standard instruments apart from those illustrated, include Surface Testers, Air-gauging Equipment (including plug gauges and calipers), Roundness Testers.

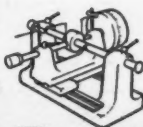
PITCH MEASURING
MACHINE



BENCH CENTRES



DIAMETER
MEASURING
MACHINE



ALFRED

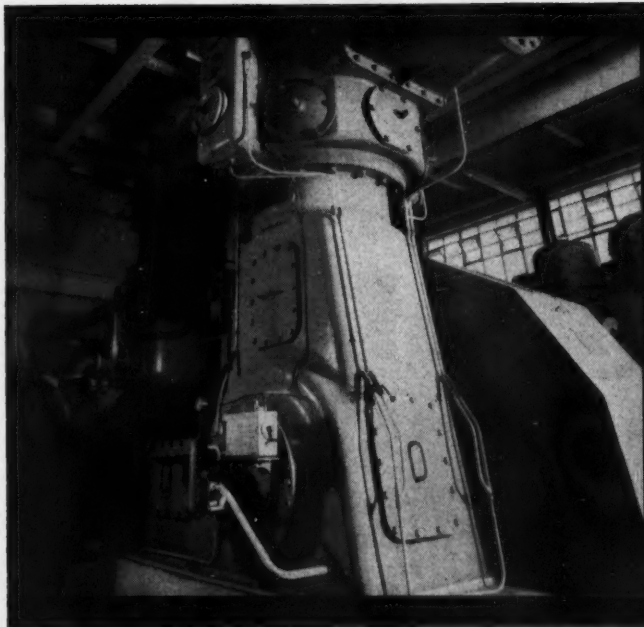
HERBERT

LTD., COVENTRY

AD 626

When answering advertisements kindly mention **MACHINERY**.

THE VITAL STATISTICS OF AIR POWER



Atlas Copco make stationary compressors for every purpose. Whatever the needs of industry, the extensive Atlas Copco range — reciprocating machines from 2.5 to 3,200 c.f.m. and Twin Air rotaries up to 20,000 c.f.m., ensure specialised equipment to meet specialised demand.

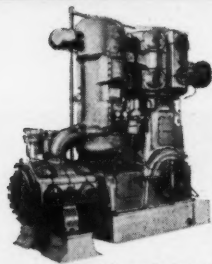
Whether industry is concerned with electrical power economies, the high cost of water for water-cooled units or that ever present problem, space shortage, Atlas Copco can help you in the provision of a suitable compressor to overcome your particular problem.

Atlas Copco are pleased to offer specialised advice and consultation on your installation, and leaflets describing the range of Atlas Copco stationary compressors are readily available on request. Write, giving some indication of the type of machine you are interested in, to your local Atlas Copco branch or to the Head Office.

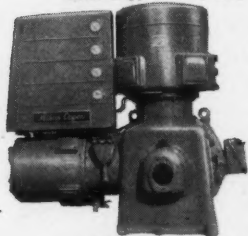
Atlas Copco compressed air engineers

ATLAS COPCO (GREAT BRITAIN) LIMITED

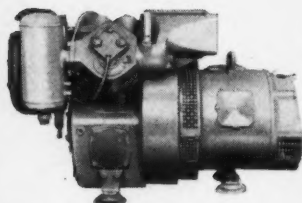
Maylands Avenue, Hemel Hempstead, Herts. Telephone: Boxmoor 6040
Sales and service depots at: LONDON: BRISTOL: CARDIFF: LICHFIELD: LEEDS:
MANCHESTER: NEWCASTLE: GLASGOW: BELFAST: DUBLIN.



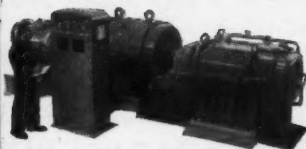
AR9 L type, heavy duty



ER6 Heavy duty type



TT6 Compact, continuous duty type



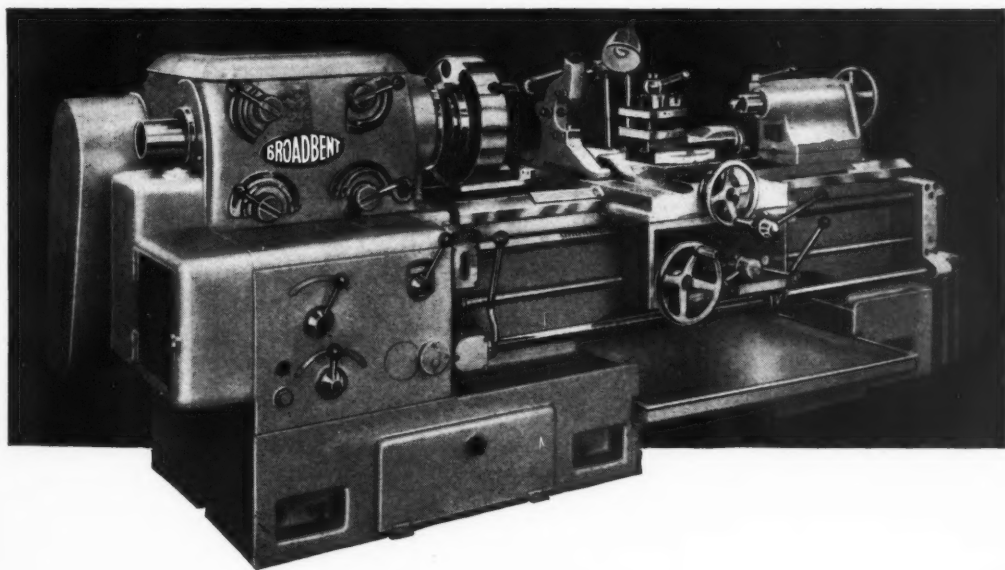
TWIN AIR Rotary Screw

When answering advertisements kindly mention MACHINERY.

MORE output per man-hour with

Good men plus good tools equal good output. Every Broadbent lathe incorporates almost a century of machine tool building. Manufacturers know that for versatility, accuracy and reliability there is nothing quite as good as a Broadbent Machine Tool.

BROADBENT
LATHES



This 18/22" Swing Heavy Duty Centre Lathe of modern design is a typical example of the Broadbent range. It has a 15 h.p. drive motor and spindle speeds up to 1,000 r.p.m.

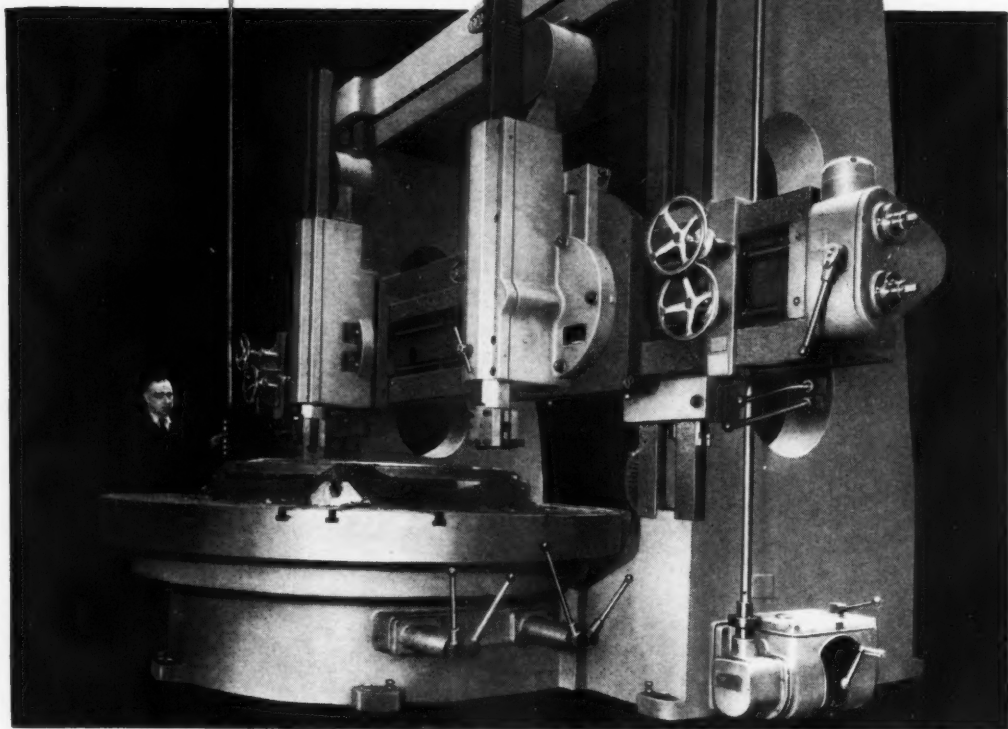
The Broadbent range of Machine Tools includes Surfacing and Screw-cutting Lathes from 17" to 72" swing, Surfacing and Boring Lathes, Break Lathes, Crankshaft Lathes and vertical Turning and Boring Mills with 5', 6', 8' or 10' capacity.



manufactured within the KERRY GROUP by
HENRY BROADBENT LIMITED
SOWERBY BRIDGE, YORKSHIRE

a **Kerry** COMPANY

Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611
Broadway/H89



HEAVY DUTY Vertical BORING & TURNING MILLS

with 5, 6, 8 or 10 ft diameter work tables

These incomparable machines are massively constructed for years of hard service. Accuracy and dependability are of the high order that industry has learned to expect of Broadbent Machine Tools. Notable features of these Boring and Turning Mills include twelve changes of speed and six changes of feed, controllable from either side of the machine; spiral bevel and spur reduction gears driving the work table; pendant control of rams and cross slides; and rapid power traverse with independent control of the two heads.

Please write for fully illustrated brochure.



manufactured within the KERRY GROUP by
HENRY BROADBENT LIMITED
 SOWERBY BRIDGE, YORKSHIRE

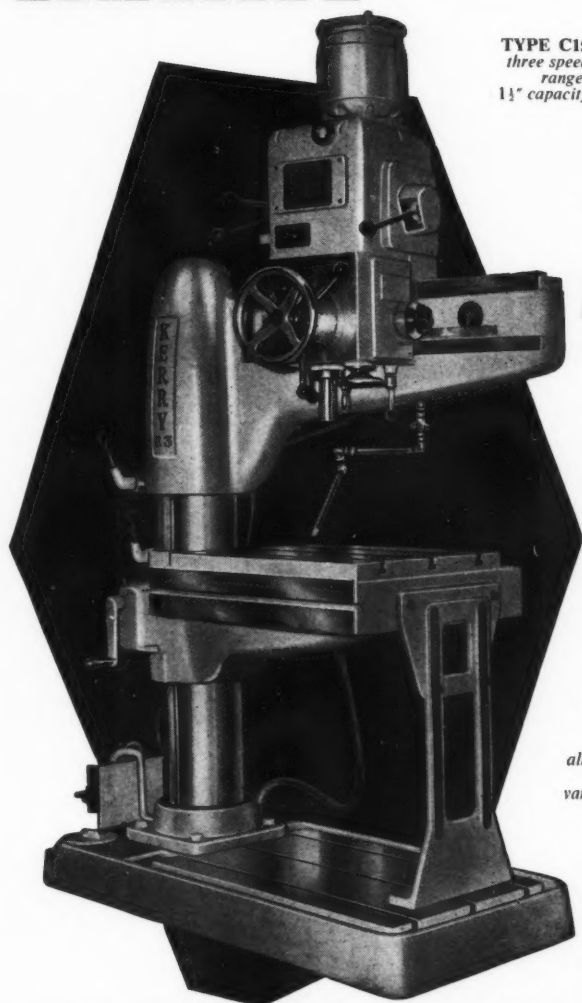
A **Kerry** COMPANY

Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611

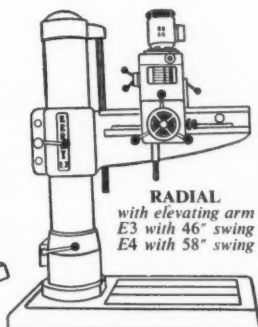
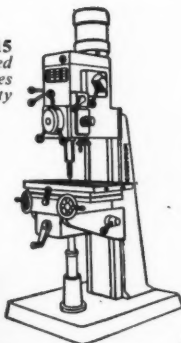
Broadway/H98

KERRY

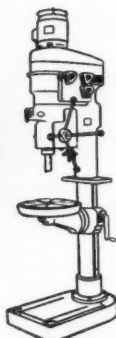
RANGE OF DRILLING MACHINES



TYPE C15
three speed
ranges
1½" capacity

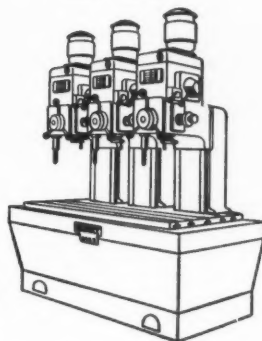


RADIAL
with elevating arm
E3 with 46" swing
E4 with 58" swing



TYPE 150 AG
all geared head also
150 IV infinitely
variable 1½" capacity

**MULTI-HEAD
MS 3**
line production
unit 1½" capacity



The Radial Drill illustrated on the left is available in 2 models. The R3 has a swing of 36", the R4, 48". Both models have a capacity of 1½" in steel and 1¼" in cast iron, 9 spindle speeds ranging from 90 to 1120 r.p.m., quick hand traverse, fine hand feed and three rates of power feed. The Kerry range of drilling machines includes bench, pillar and line production models with drilling capacities from ½" to 1½".

Full details from your Machine Tool Merchant or our Sales Office

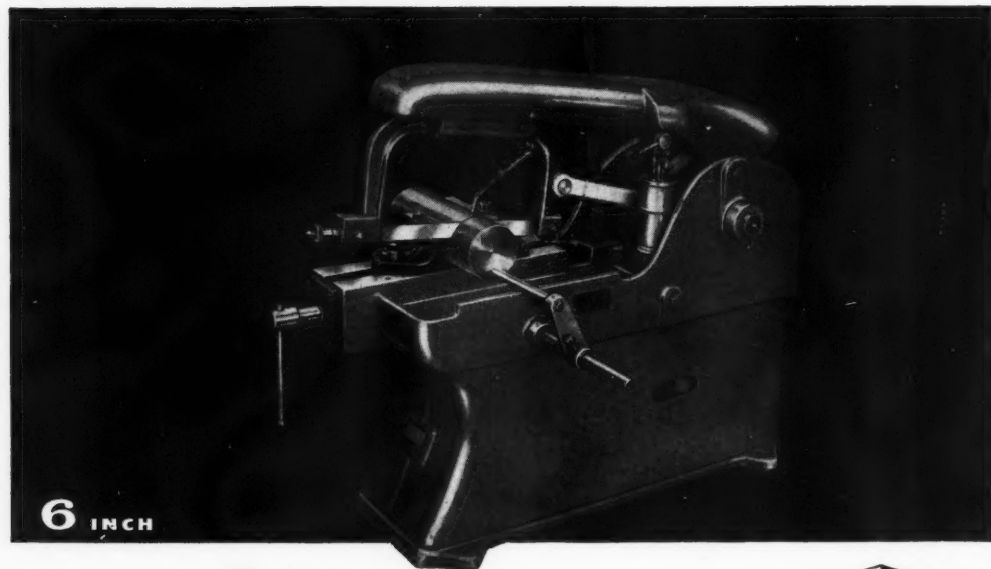


manufactured within the **KERRY GROUP** by
QUALTERS & SMITH BROS. LTD
BARNSELY, YORKSHIRE

a **Kerry COMPANY**

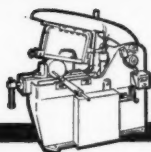
Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611

Broadway Q511

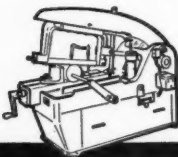


6 INCH

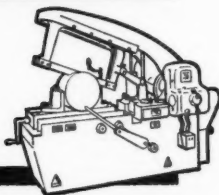
8 INCH



10 INCH



12 INCH



Full details from
your machine tool
merchant or
our Sales Office

The Famous



SAWMASTERS

**are the finest
HEAVY DUTY HACKSAWS
in the world**

Modern in design, robust and precise in construction, these unrivalled machine saws cut accurately and rapidly, and offer maximum production efficiency. Refinements include totally enclosed drive, hydraulic relief on the return stroke and automatic lifting of the bowslide to loading position on completion of cut.

Instant lever selection of correct cutting speed is a feature of all but the smallest model.

—and the famous SAWMASTER Autocut Power Bandsaw.



manufactured within the KERRY GROUP by
QUALTERS & SMITH BROS. LTD
BARNSELY, YORKSHIRE

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Broadway/Q58

KERRY

PILLAR DRILLS

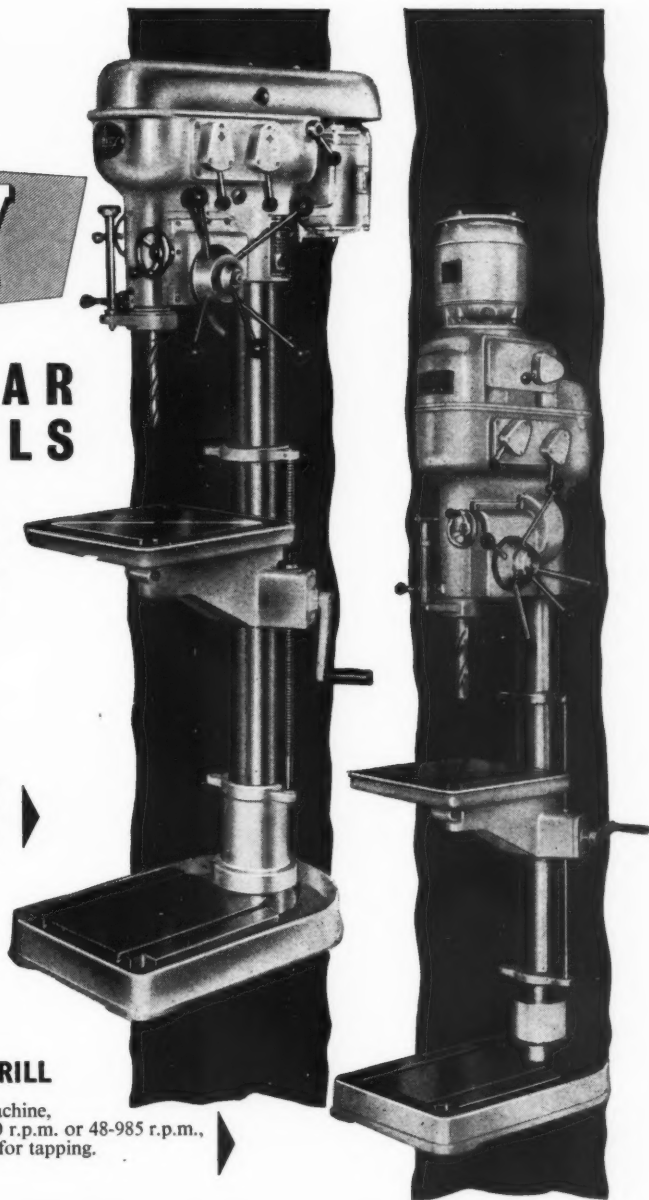
These machines are renowned for their high standard of performance and dependability under the most arduous operating conditions to be found in industry today. Modestly priced, sturdily built and extremely versatile, they will give years of trouble-free service.

KERRY '100' POWER FEED PILLAR DRILL

A 1 inch capacity machine with nine speeds ranging from 70-1,500 r.p.m., a lever operated gear change with totally enclosed gear box and power feed, available with either a square or circular table.

KERRY '125' PILLAR DRILL

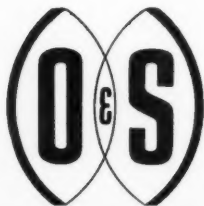
A 1½ inch capacity, all-g geared head machine, giving nine spindle speeds from 70-1,500 r.p.m. or 48-985 r.p.m., 3 rates of power feed reverse to spindle for tapping.


KERRY'S

manufactured within the KERRY GROUP by
KERRY'S (Engineering) CO. LTD
 GRANGE ROAD, LEYTON, LONDON, E.10

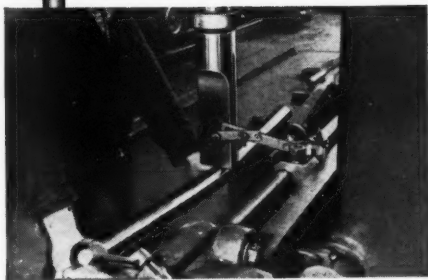
A Kerry COMPANY

Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611



STRAIGHTENING PRESSES

O & S Straightening Presses, made in 5 sizes with capacities ranging from 4 to 60 tons pressure, have for many years been the first choice of engineering firms throughout the world, including most of the leading motor manufacturers. For speed, accuracy and ease of operation, O & S Straightening Presses are in a class of their own.



In the Leicester works of Frederick Parker Ltd., O & S Straightening Presses are in daily service ensuring that steel shafts are perfectly straight and true.



manufactured within the KERRY GROUP by
OLDFIELD & SCHOFIELD CO. LTD
BOOTH TOWN, HALIFAX, YORKSHIRE

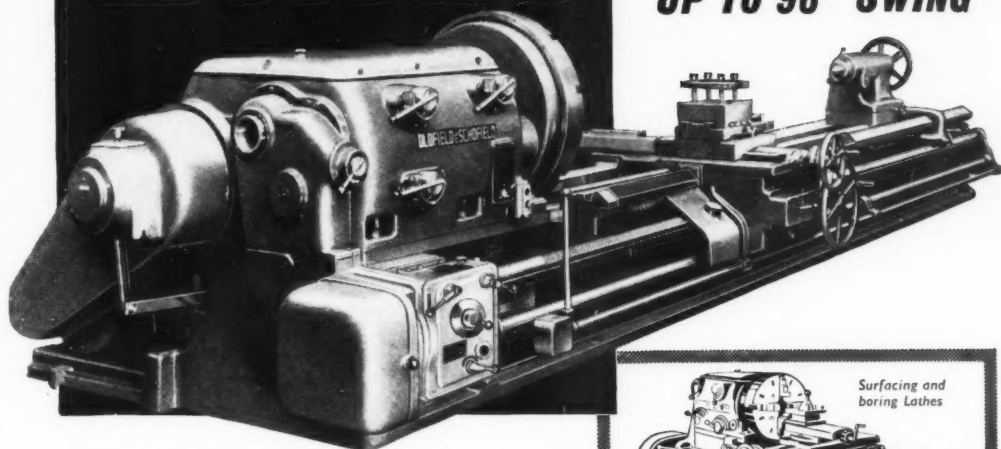
a Kerry Company

Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARYland 6611

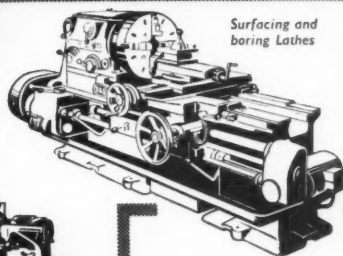
Heavy Duty LATHES



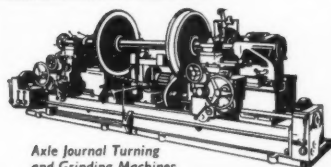
UP TO 96" SWING



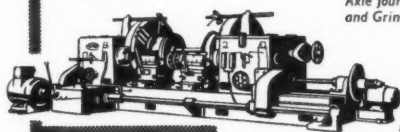
18½" Centre 'D' Type Lathes. Built in sizes up to 48" swing.



Surfacing and boring Lathes



Axle Journal Turning and Grinding Machines



Heavy Duty Double Wheel Lathe

O & S have for many years manufactured a wide variety of heavy lathes which have earned for the

company a fine reputation for precision engineering and first class craftsmanship. The range includes Surfacing and Boring Lathes up to 96" swing, Brake Lathes, Axle Lathes, railway carriage and waggon wheel lathes, axle journal turning and burnishing lathes etc., all embodying the latest developments in modern lathe design.



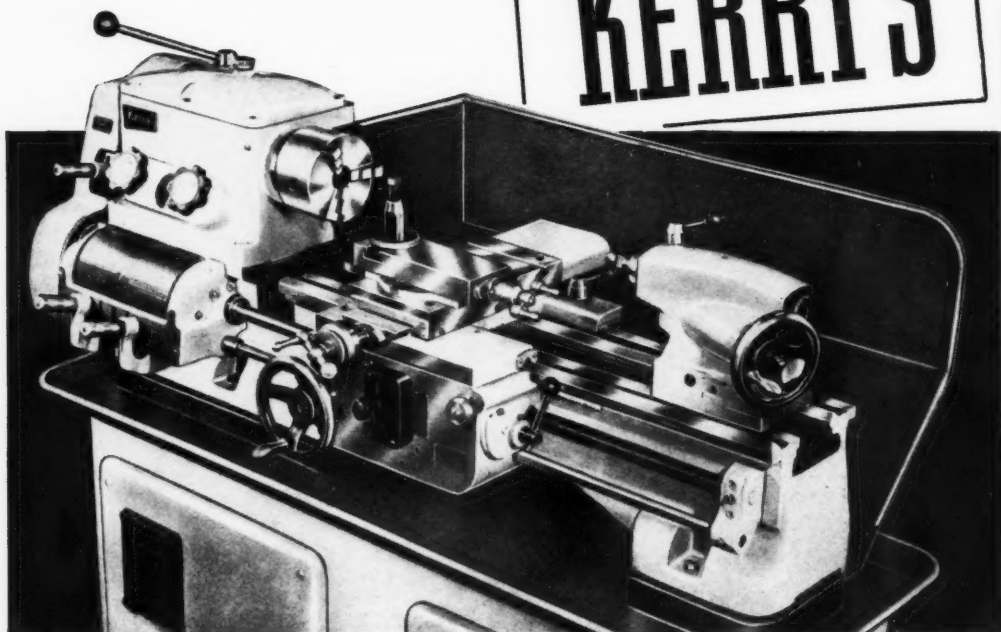
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OLDFIELD & SCHOFIELD CO. LTD
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11" SWING LATHES

*THOUSANDS in use in Great Britain
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- ★ SLIDING, SURFACING AND SCREWCUTTING LATHE
- ★ ALL GEARED HEADSTOCK GIVING 9 SPEEDS RANGING FROM 39-1500 r.p.m.
- ★ TYPE LOO PRECISION TAPERED SPINDLE NOSE
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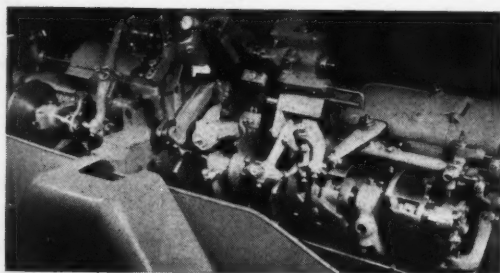
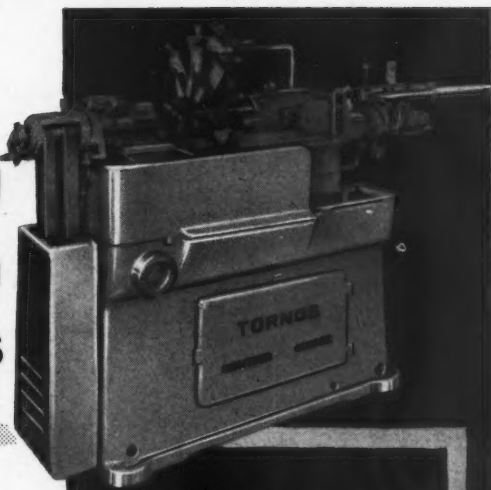
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outstanding design features



CAMSHAFT

This is in one piece giving perfect synchronisation of Cams. It is hardened ground and lapped and runs in four robust bearings. Axial and end play are adjustable. All cams can be readily fitted without disturbing Camshaft or bearings.

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TORNOS

SLIDING HEAD AUTOS

unsurpassed
versatility
and
productive
capacity

TORNOS AUTOMATICS

include the following sizes:

MODEL	MAX. DIA. BAR
M4	5/32 ins.
M7	9/32 ins.
R10	15/32 ins.
R16	5/8 ins.
RR20	25/32 ins.
MR28	1.3/32 ins.
MR32	1.1/4 ins.

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Telephone: COVENTRY 26815

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CARBON CHROME ALLOY STEEL GROUND FLAT STOCK

*Guaranteed
to ± 0.001 in
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Indispensable in the manufacture of jigs, templates, gauges, press tools, etc., oil hardening, non-distorting steel in standard 18in. lengths. Each piece separately packed with full heat treatment instructions. Standard 18in. lengths also non-standard sizes 12in., 24in. and 36in. lengths. Widths from 3/16in. to 12in., thicknesses from 1/32in. to 2in.

We hold large stocks of non-standard sizes and Round Stock 1/4in. to 2 1/2in. dia.

**30,000 LENGTHS ALWAYS
IN STOCK**

Write for specifications and prices

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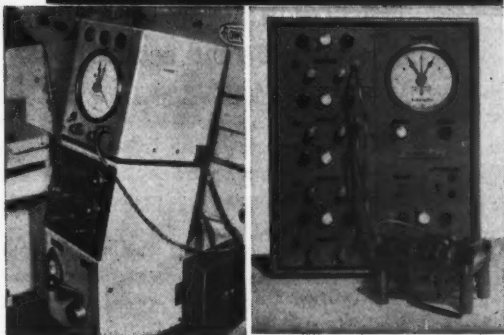


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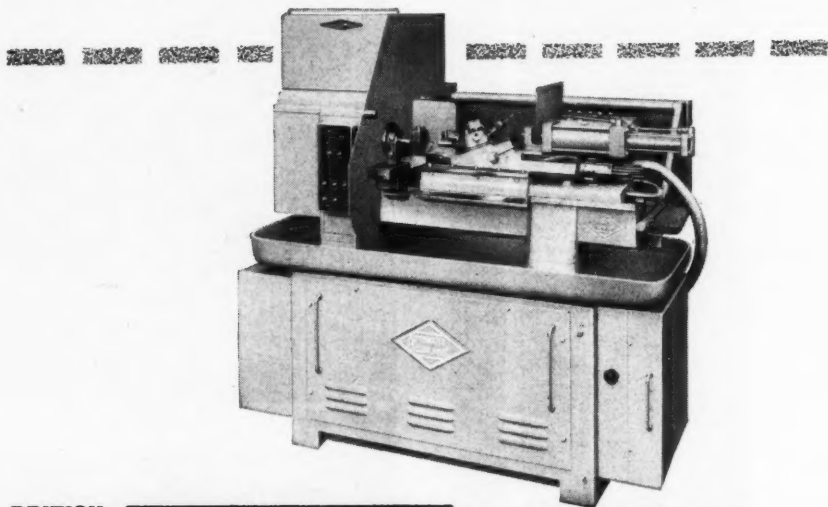
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HIGH SPEED PRECISION CAPSTAN

13/16" bar capacity

With automatic control, this new model combines versatility with rapid, consistent output. Simple to set, slide movements *and* speed and feed values are selected by means of plug-in electrical connections on the NICKOLS Sequence Control unit. The set-up can be changed quickly from continuous cycle for bar work to single cycle for chuck work. Movements can be programmed to take place simultaneously, in sequence or in overlapping sequence. By linking sockets, movements can be kept in operation as long as necessary and time delays can be introduced on any step to provide tool dwell.

Bar capacity 1 1/8". Centre height 5 1/4".

Turret slide stroke 3". Spindle speeds 37 to 3000 r.p.m.

Send for brochure M/204

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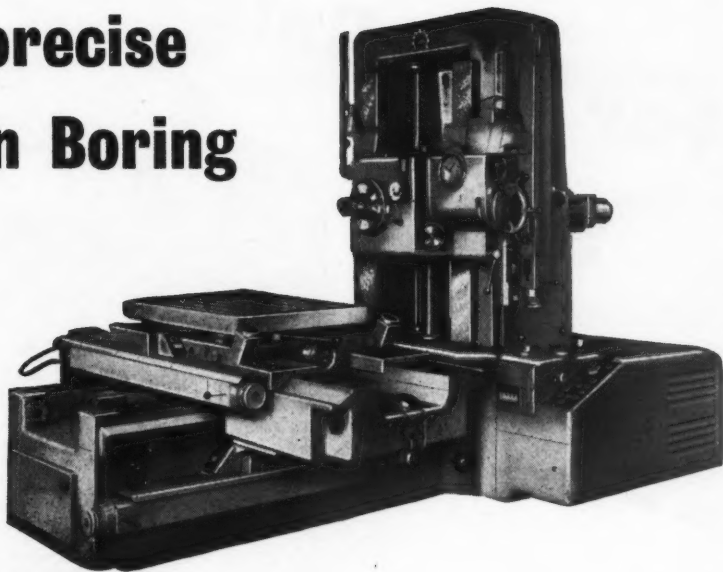
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NOW...

— really precise Repetition Boring



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DIXI

HORIZONTAL OPTICAL JIG BORER MODEL 75 OG

With bridged double columns the DIXI '75' is immensely rigid. Optical settings direct reading to .00005" are required for the first workpiece only and with semi-automatic positioning can be repeated quickly and accurately on subsequent components. Quick change pre-set tools permit rapid operation. Built-in rotary table has projected settings to 1 sec. and swivels through 360° permitting work to be machined from each side, or at compound angles, without disturbing its setting. Additional 17½" optical circular table with dividing accuracy of 1 sec. can be mounted horizontally or vertically.

Boring spindle dia. 3". Table size 39½" x 32"
Traverses: Longitudinal 23½", transverse 29½", vertical 25½".

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SOLE U.K. DISTRIBUTORS



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Removal**



INNOVATION

PRODUCTION LATHE MODEL T5 with BRËCHE single-point Thread Chasing Attachment

Robust, built with meticulous care by craftsmen, this machine has a remarkable capacity for stock removal. Bed and base form a rigid unit. The spindle is mounted in 3 precision Gamet bearings. Carriage and cross-slide are unusually robust permitting multiple carbide tooling to be used both front and rear. Quick-acting micrometer cross-traverse stops are provided, and for the longitudinal motion also. With the BRËCHE single-point Thread Chasing Attachment external, internal and taper screwcutting can be performed exceedingly rapidly.

Swing over bed 13½". Centre distance 21½". Spindle speeds (9) 180 to 2800 r.p.m.

MODEL T6: Swing over bed 17½". Centre distance 27½". Spindle speeds (12) 45 to 2000 r.p.m.

See the T5 machine at our Showrooms or send for brochure M/193 to Sole U.K. Distributors



193

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DAVID BROWN**THE DAVID BROWN CORPORATION (SALES) LIMITED****GEAR DIVISIONS****Park Works****HUDDERSFIELD. Tel. 3500****COVENTRY GEAR DIVISION****Brooklyn Road, Foleshill****Tel: Coventry 88004****LONDON GEAR DIVISION****Stonebridge Park Works,****N. Circular Rd., N.W.10 Tel: ELGar 6824**

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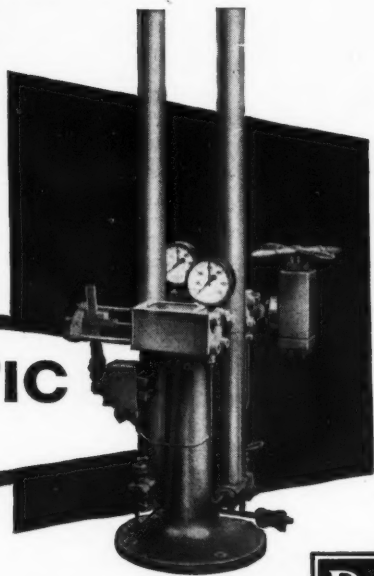
MODERN HYDRAULIC ACCUMULATORS-

BY WERNER AND PFLEIDERER

- ★ Entirely self-contained
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- ★ Extremely smooth operation
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—equipped with the unique

HYDRO-PNEUMATIC AUTO-CONTROL



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THIEL II7

Precision Bandsawing
& Bandfiling Machine

SPEEDS INFINITELY VARIABLE • 50-3000 FT/MIN

20" THROAT

Other Principal Features



- * 10" maximum work height
- * 24" x 24" table swivels 30° to right and left, 15° to front and back
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- * Rapid changeover from sawing to filing
- * Butt welding unit and grinding wheel enclosed in machine body
- * Original THIEL bandsaws and bandfiles now available.

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Horizontal BORING, DRILLING & **MILLING** Machines

Now British Built



Close tolerances required in Milling, Boring, Drilling and Tapping 'U.S.' MULTI-SLIDE Beds are maintained on Model 350-T machine at ALLTOOLS LTD., Brentford.



4" DIA. SPINDLE
(20 H.P. MOTOR)
OR 5" DIA. SPINDLE
(25 H.P. MOTOR)

LONG LASTING
JIG BORING
ACCURACY

AMPLE POWER
FOR HEAVY DUTY
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WIDE CHOICE OF
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WIDE RANGE OF
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UNEQUALLED
MACHINING
VERSATILITY

DIRECT READINGS
TO 0.001" OF
HEADSTOCK AND
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BRIEF SPECIFICATIONS

Model	340-T	350-T
Diameter of spindle	4"	5"
Spindle motor	20 h.p.	25 h.p.
Spindle speeds (45)	10-1300 r.p.m.	7.5-975 r.p.m.
Max. table cross travel	132"	132"

EQUIPMENT AVAILABLE includes
EXTENDED SADDLE AND SADDLE SUPPORTS with in- or over-the-floor type auxiliary runways.
IMPROVED MEASURING DEVICE giving readings to 0.0001".
AUTOMATIC ELECTRIC POSITIONING—positive settings within 0.0002".
HEAVY DUTY ANGULAR MILLING ATTACHMENTS.
CONTINUOUS FEED FACING AND BORING HEADS.
Many types of AUXILIARY and BUILT-IN ROTARY TABLES.
DAVIS SUPER MICROMETER STUB BORING TOOL SETS.

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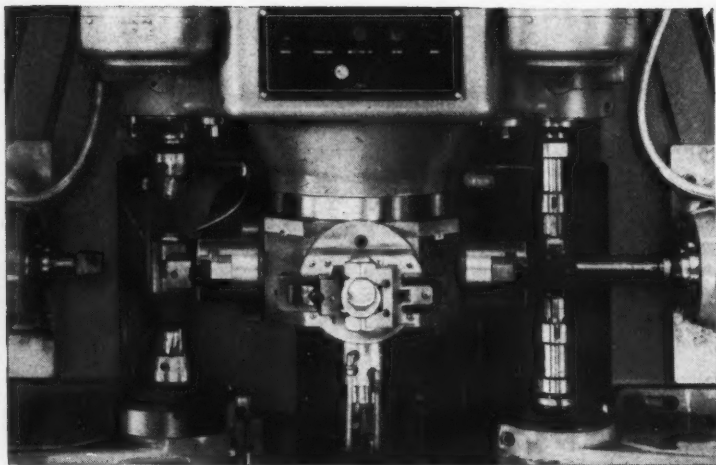
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Diedesheim fully Automatic multi-unit machine

for the production of pipe fittings, valve and cock bodies
and similar components

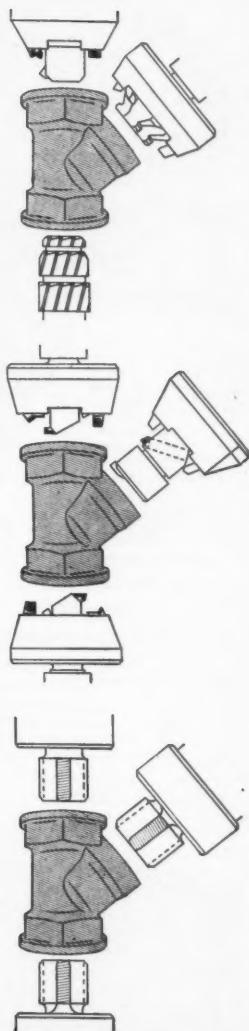
MODEL AMI WITH 9 UNITS

MODEL AMII WITH 12 UNITS

- Suitable for drilling — boring — facing — threading — sawing — milling — multi-spindle drilling & tapping, etc.
- Simultaneous machining — from three directions — at each station.
- Capacity for $\frac{3}{8}$ " to 2" nominal size pipe fittings
- Spindle speeds to suit all materials
- Infinitely variable feed to each unit
- Foolproof reloading during cutting cycle
- Hydraulic chucking with auto-release
- Rapid change-over to different components
- Three or four working stations

Production times for lateral valve housing illustrated:

$\frac{1}{2}$ " nom. size: 7 secs. 1" nom. size: 10 secs. 2" nom. size: 18 secs.



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Machine Tool Co. Ltd

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DIATEST

HIGH PRECISION Small-Bore Gauge

DIATEST Gauges are the solution to your checking problems!

NO MORE TROUBLE GAUGING

blind bores,
tapered bores,
incomplete bores,
barrel-shaped bores,
out-of-round bores,
where other bores interfere

DIATEST Gauges can be operated by unskilled labour.

DIATEST Unit Heads are hard chromium plated to withstand wear.

Minimum Bore ----- 0.039in.
Readings in ----- 0.0001in.
Range ----- 0.039in.-12.000in.

ALL PARTS INTERCHANGEABLE

* WRITE FOR COMPLETE DETAILS TO THE SOLE IMPORTERS



MICHAEL S. THOMPSON LTD.

185, HAMMERSMITH ROAD, LONDON, W.6, ENGLAND.

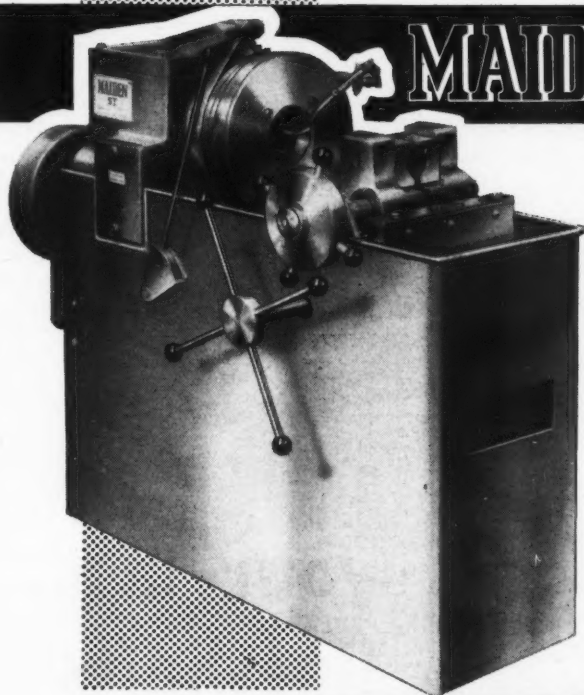
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Telegrams TOMTOOL, LONDON, W.6.

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LOW COST THREADING MACHINE

WITH INBUILT TAPERING MECHANISM



MAIDEN C/ST

2 C/ST

1/4" - 2" Pipe : 1/4" - 2" Bolt

4 C/ST

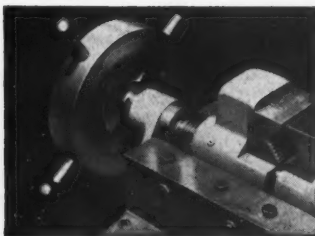
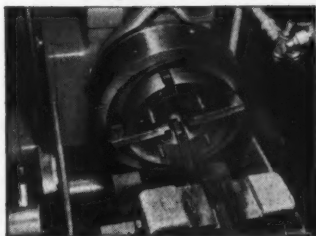
1/4" - 4" Pipe : 1/4" - 2" Bolt

EXCLUSIVE FEATURES

1. Forged Steel interchangeable Diehead, wear resistant to ensure a long and accurate life.
2. Hammer blow vice gives maximum grip with least effort (illustrated with cover removed).

For maintenance or variety work a Radial diehead can be set up in a fraction of the time required by other types.

Send for brochure MA.6224

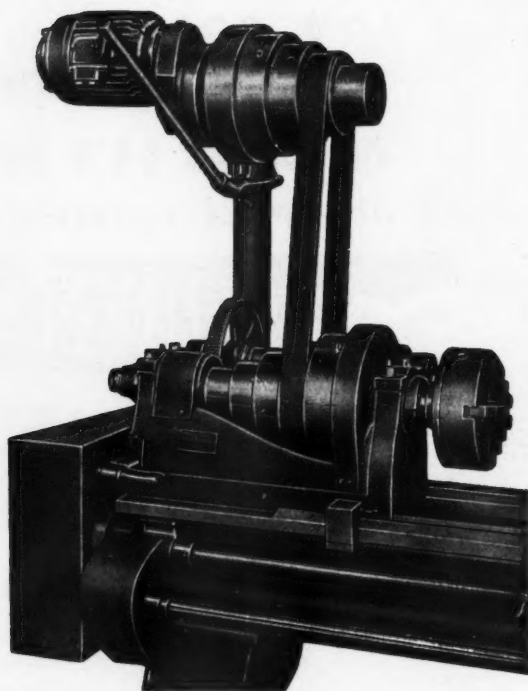


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LANDIS MACHINE-MAIDEN LIMITED
HYDE • CHESHIRE • ENGLAND

SM/MA 6224

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SCRAP your last lineshafts

Motorise your machine-tools economically

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SADI

INDIVIDUAL DRIVES

An economical unit readily adaptable to your machines without any structural alterations. A complete range of speeds and H.P. to suit specific requirements.

Over fifty thousand units in service throughout the world.

Ask for literature No. MC/MT

THE SADI ENGINEERING CO. LTD.

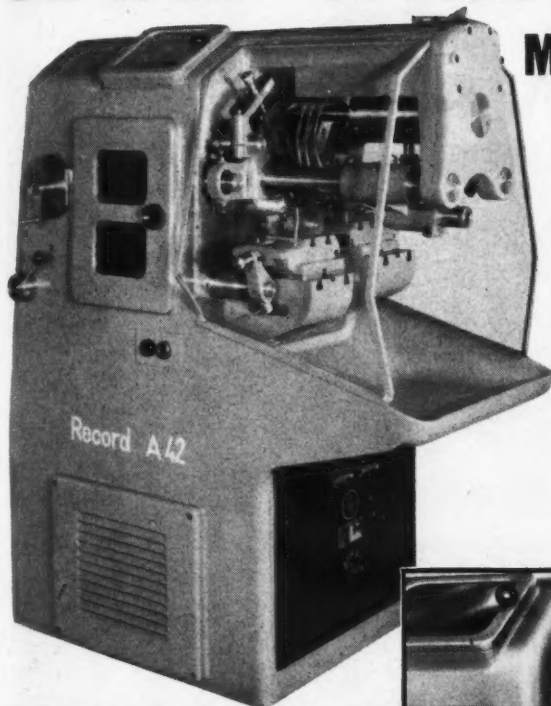
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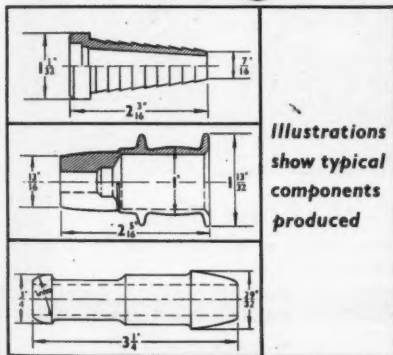
SINGLE SPINDLE AUTOMATICS



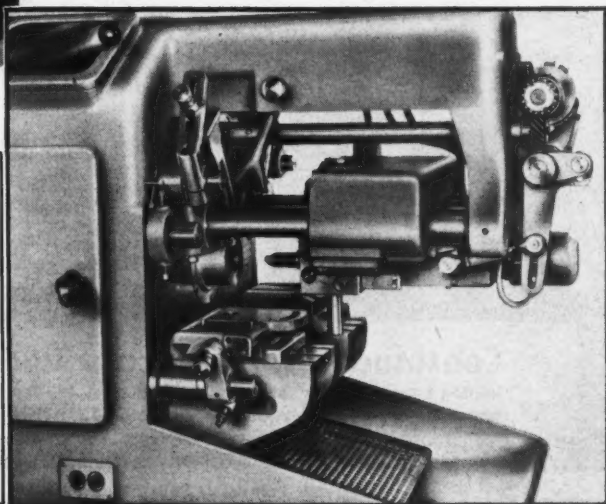
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Provided with two horizontal cross slides, two vertical slides, one drilling slide, 6 h.p. main motor, $1\frac{1}{2}$ h.p. feed motor.

Please send for full details.



*Illustrations
show typical
components
produced*



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NRP 3476

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3 SECS

Continuous milling cuts floor-to-floor time

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Material—die-cast alloy, number on table—12. Time allowance—3secs.

Production milling time on many different components can be cut considerably with this versatile Model 2VR continuous vertical miller, with first-class finish and without strain on the operator.

Continuous milling cuts the unproductive waste out of floor-to-floor times. No time is

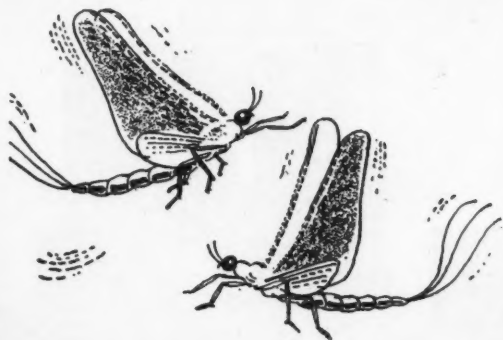
lost in traversing or loading and unloading. The 2VR is milling *all the time*.

Write for a new leaflet showing how we have approached many typical cases. Let us see if we can do any of your jobs faster and better by *continuous milling*.

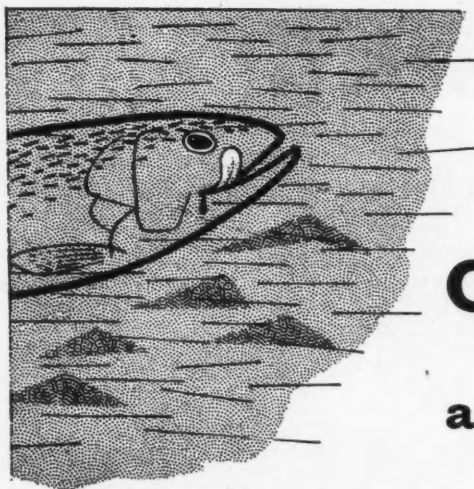
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Remember—for most purposes concrete made with CIMENT FONDU is ready for use 12 to 15 hours after placing, and at 24 HOURS it is stronger than other concretes 90 DAYS old. Also, used with suitable aggregates, CIMENT FONDU produces Refractory and Insulating concretes of the very highest quality.

For machine foundations, floor, road and factory entrance repairs and renewals CIMENT FONDU is unequalled. CIMENT FONDU

can save you time and money on your concrete work by eliminating waiting time.

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CENTRE LATHES from 16" height of centres

VERTICAL BORING AND TURNING MILLS from 8' 0" dia. table

PLANING MACHINES from 8' 0" work width

ROLL TURNING LATHES

ROLL GRINDING MACHINES

HORIZONTAL BORING AND MILLING MACHINES

GEAR HOBBING MACHINES 40" to 21' 0" work dia.

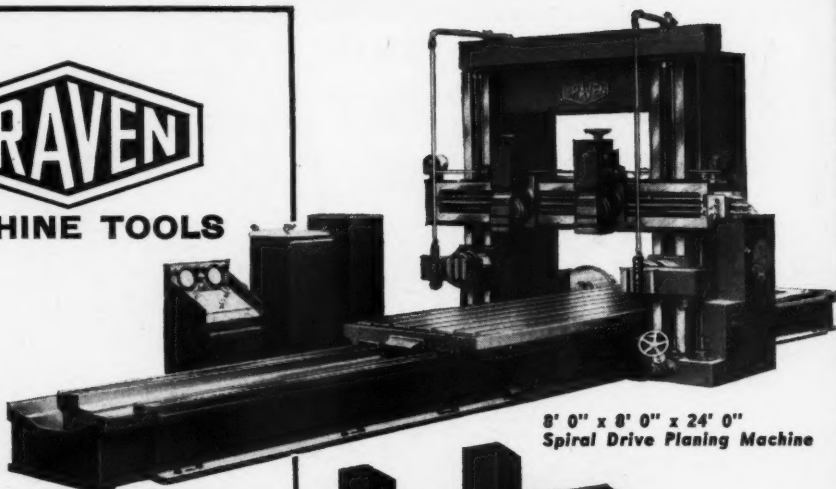
HIGH SPEED TUBE BORING AND TREPPANNING MACHINES

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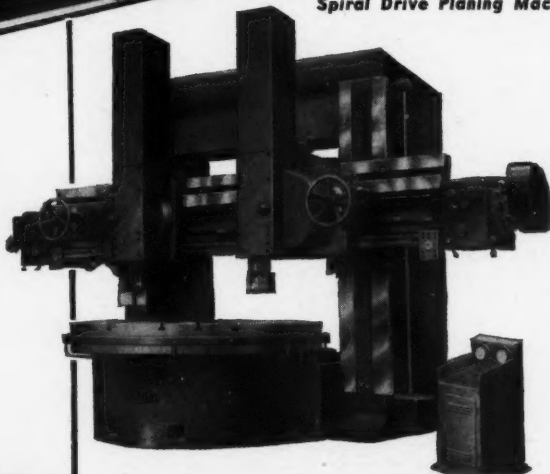
RAILWAY AXLE LATHES

CRANKSHAFT LATHES

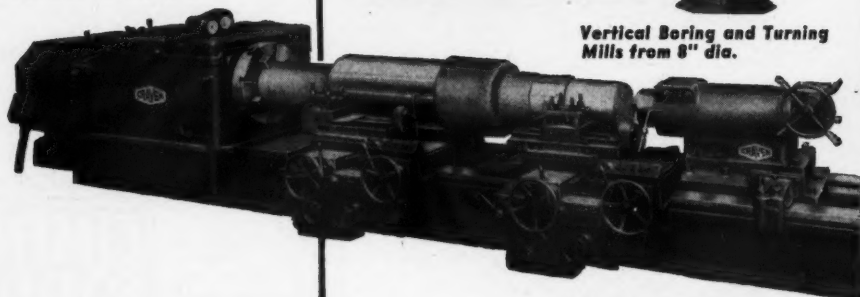
ROTARY CRANKPIN MACHINES



8' 0" x 8' 0" x 24' 0"
Spiral Drive Planing Machine



Vertical Boring and Turning Mills from 8" dia.



High Speed, Heavy Duty, Sliding and Surfacing Lathe,
20" height of centres,
100 h.p. drive.

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VAUXHALL WORKS : REDDISH · STOCKPORT · ENGLAND

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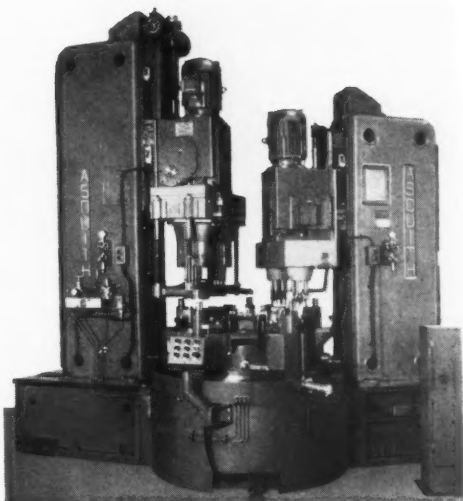


UNIT TYPE MACHINES

*fully engineered
for high-output production*

Asquith Five Station Rotary Transfer Machine for drilling, reaming and tapping operations on a Vauxhall hub component.

Asquith Two Way Machine supplied to R. A. Lister Ltd., Dursley, for the production of 6 cylinder Diesel crankcases.

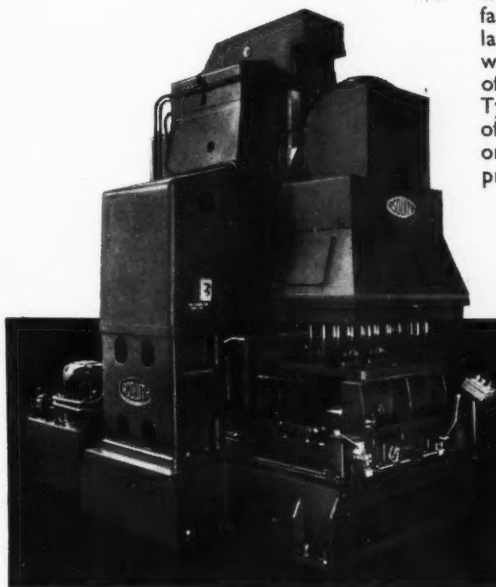


Asquith Units from $\frac{1}{2}$ h.p. upwards can be arranged as individual, multi-way, rotary transfer and in-line transfer machines for fast, automatic production. If you require large quantity output of components it will be worth investigating the possibility of machining them on an Asquith Unit Type Machine. Write today for details of the Asquith range of Unit Equipment or ask for a specialist to discuss your problem.

WILLIAM ASQUITH LTD.

HALIFAX · ENGLAND

Member of the Asquith Machine Tool Corporation



INDIVIDUAL HEAD MACHINES

MULTI-WAY MACHINES

ROTARY TABLE TRANSFER AND

IN-LINE TRANSFER MACHINES

Sales and Service for the British Isles

DRUMMOND - ASQUITH LIMITED

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Motorised Heavy Duty GRINDING SPINDLES

...are readily adaptable for surface grinding and internal grinding, when used as ATTACHMENTS ON BORING MILLS, PLANING MACHINES & HEAVY LATHES, ETC.



Illustrated are two Type HRF/S 1 units fitted with slanted side flanges (feet) for slide rest mounting, having, respectively, 12in. and 18in. snout extensions.

The motors used in the construction of our Grinding Spindle units are of the heavy duty squirrel cage, totally enclosed dust proof type and are available in ratings of 2 B.H.P. at 2,800 R.P.M. and 2 and 3 B.H.P. at 1,450 R.P.M. A.C. 3 phase, any one standard voltage. Designed with oversize nickel chrome spindles, carried in precision ball thrust and roller bearings; the complete rotors are dynamically balanced.

The rigid steel stator can be fabricated with any shape of FIXING FOOT (DRILLED or UNDRILLED, with or without TONGUE), SHANK, BRACKET, END FLANGE, etc., for SLIDE REST mounting, TOOL POST mounting, etc., to suit CUSTOMERS' SPECIAL REQUIREMENTS.

Snout extensions can be fitted from 4½in. up to 18in. The Type HGR units are fitted with sliprings to permit 'planetary grinding' where the work piece is stationary and the grinding spindle is mounted on the face-plate of the machine tool.

The Types HGR are available with standard snout extensions of 6in., 12in., 18in. or 24in.

WRIGHT ELECTRIC MOTORS (HALIFAX) LIMITED
Manufacturing Electrical and Mechanical Engineers
ESTABLISHED 1900

Century Works . Pellon Lane . Halifax . England
Phone: 60201/2 Cable: 'Motor, Halifax'

TELEX No. 51101

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HRF/S 1
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new

Meehanite

Casting Service

MEETS THE INCREASING DEMAND FOR INFORMATION
ON MEEHANITE

This service is available to all users of Meehanite and offers:-

- Technical advice on Casting Design and applications.
- Technical data on properties and uses of Meehanite castings.
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- R2 Meehanite Casting Design 10 Basic Rules
- R3 Designing Meehanite Castings to Cut Costs
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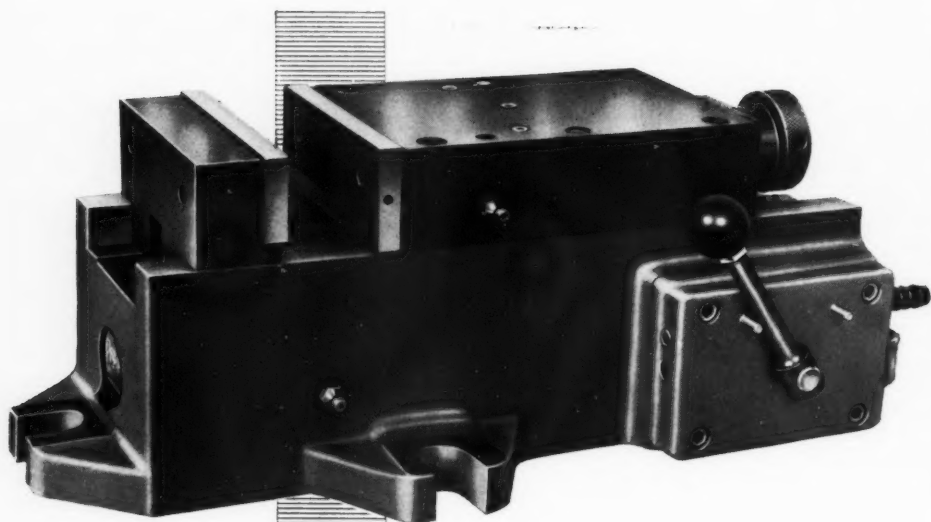


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The **PRATT**

PNEUMATIC MACHINE VICE

PRINCIPAL DIMENSIONS

Width of Jaw	4½"	6"
Depth of Jaw	1⅝"	1⅞"
Maximum Opening	2½"	4½"
Minimum Opening	0"	1½"
Power Movement	½"	⅞"
Gripping Force at 80 P.S.I.	4,800 lbs	7,700 lbs
Length Overall	15½"	19½"
Width Overall	7⅝"	9⅝"
Height Overall	5¼"	6⅝"
Weight (approx.)	54 lbs	126 lbs



RAPID OPERATION

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ROBUST CONSTRUCTION

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FOR INCREASED PRODUCTION

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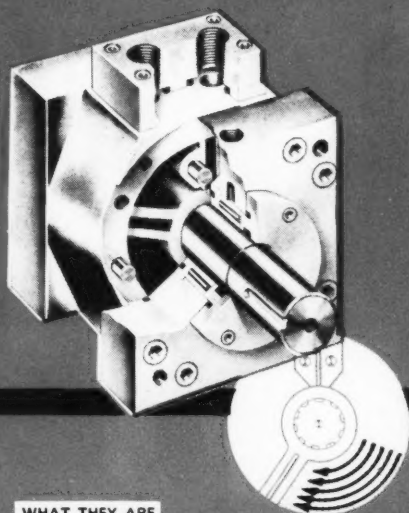
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KEELAVITE**Hydraulics****ROTARY TORQUE ACTUATORS
(ROTAC)**

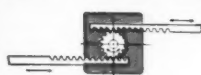
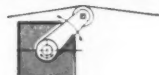
give highest torque in least space

**WHAT THEY ARE**

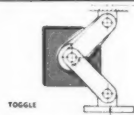
Keelavite/Rotac units are operated hydraulically at low to medium pressures, developing instant torque in either direction. For single vane units the motion is limited to a maximum arc of 280 degrees by the fixed shoe within the cylinder. Power can be doubled by the use of two vanes. In this case the arc of travel is 100 degrees.

WHY THEY ARE BETTER

Torque actuators provide high power in a small space with simple mountings. They can replace other types of actuators, such as cylinders, which require complicated linkage to perform the same functions. In hydraulic systems torque actuators are an ideal solution to many complex mechanical problems.

STRAIGHT LINE MOTION
DOUBLE TRAVEL

TROLLEY OR CONSTANT TENSION



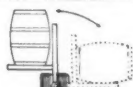
TOGGLE



HIGH TORQUE RATCHET DRIVE



CLAMPING OR TUBING



ROLL OVER OR UPENDING



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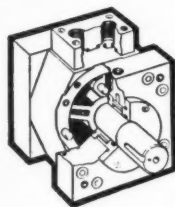


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TYPICAL USES

Opening and closing valves.
Opening and closing doors.
Automation and machine tool uses including:
indexing, feeding,
transferring, clamping,
locating, turning over.
Freight car tipping.

Crane boom operation.
Pipe and tube bending.
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Foundry equipment.
Materials handling and control of movement on conveyors.



1. Choice of mountings for fixing at any angle in any position.
2. Effective sealing means no oil leak therefore positive control of shaft rotation.
3. Working mechanism fully sealed from dirt.

Keelavite/Rotac rotary actuators are manufactured in the United Kingdom

under licence from the **XLO** Corporation

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KEELAVITE**Hydraulics**

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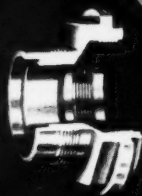
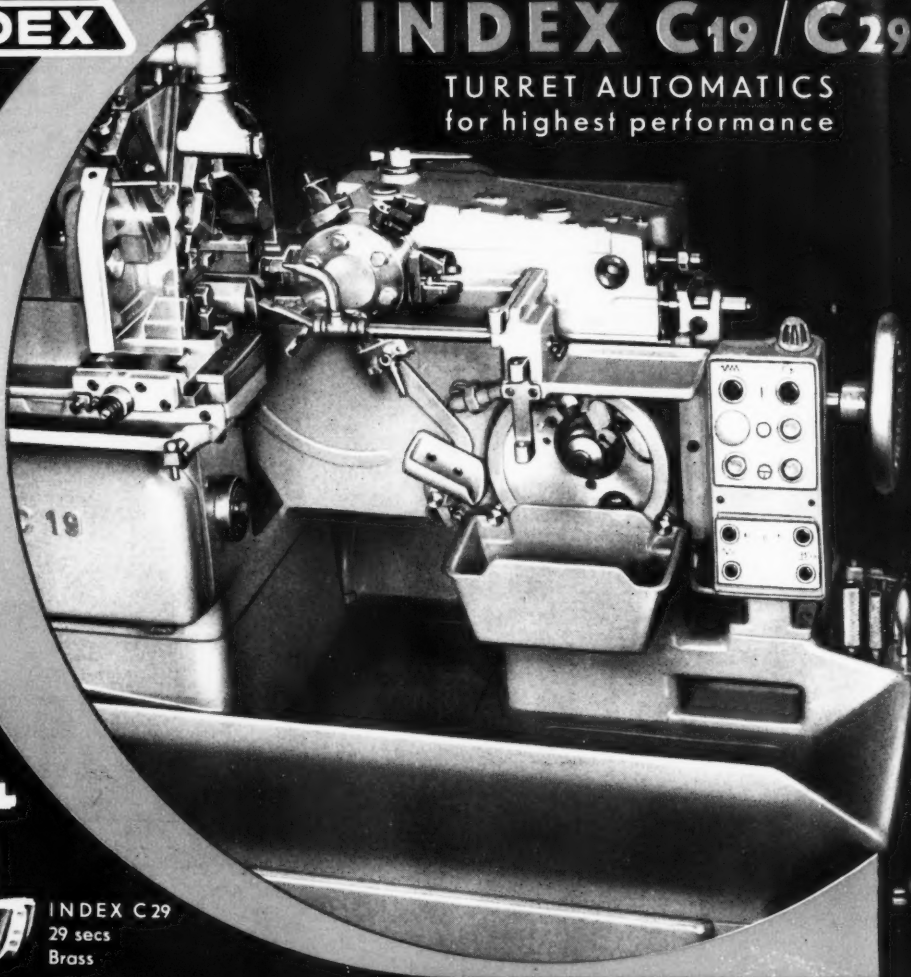
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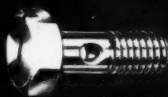


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TURRET AUTOMATICS
for highest performance



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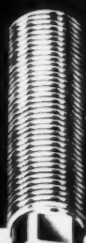


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Maximum Spindle Speeds
5300 and 3750 r. p. m respectively.
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ROTARY INDEXING MACHINE
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Special features on this
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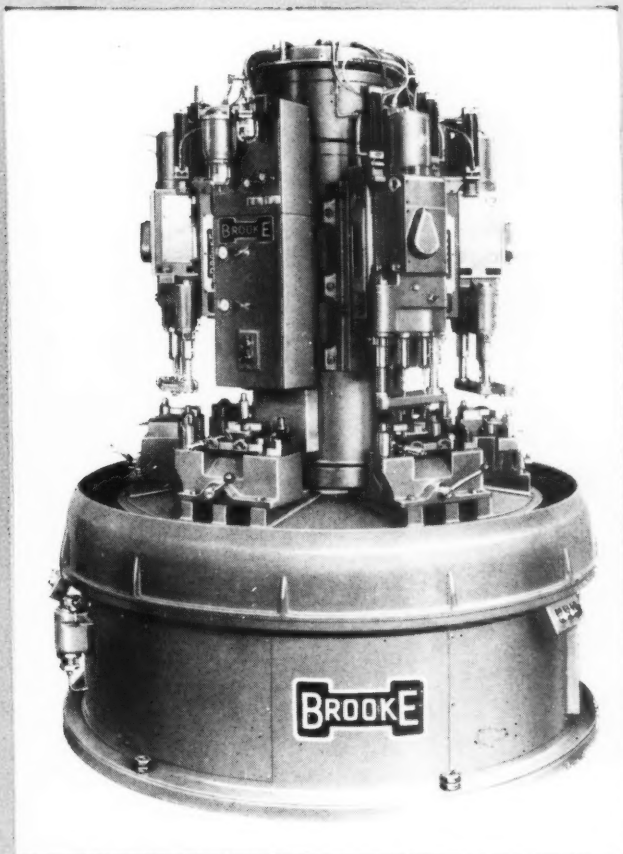
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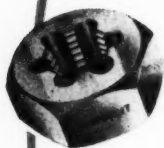
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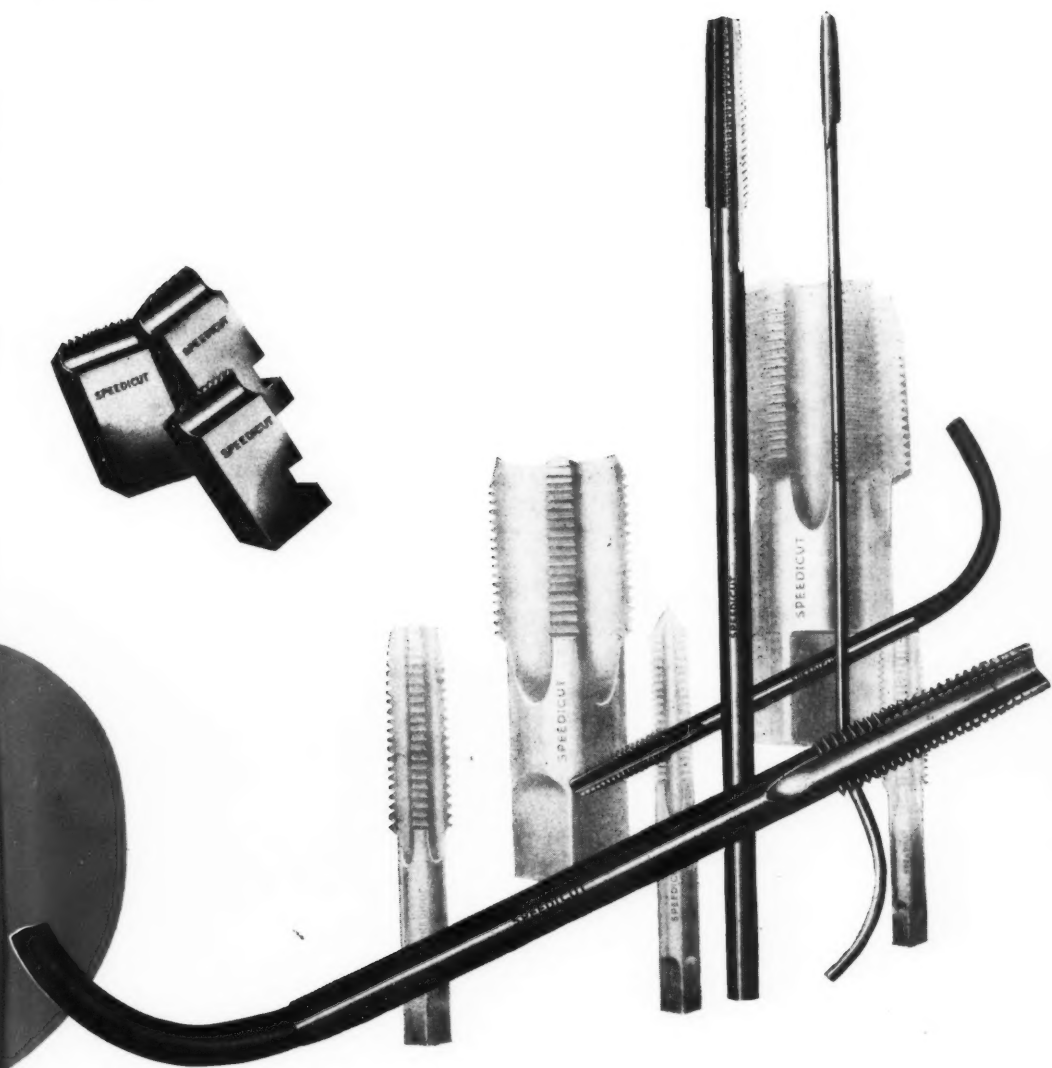
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Speedicut Taps, working at a peripheral speed of 150 ft. per minute, give the remarkable cutting time of 1.2 seconds for a $\frac{1}{4}$ " B.S.F. nut.

The tap life on 28/32 tons tensile steel nuts is 40,000/60,000.

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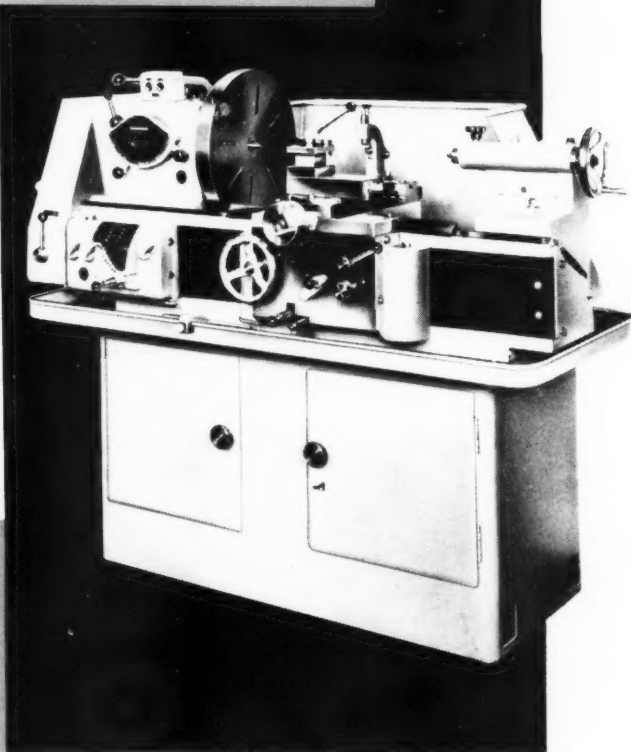
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The WILLSON Inclined Bed Centre Lathe Mark 1, represents a unique combination of time-proven design principles, modern refinements, and striking new advances in machine tool technology. Taper roller bearings, totally enclosed motor, extreme rigidity with clean chip flow lines; these will be found on WILLSON Lathes, and in addition are to be found such striking features as the fully protected double inverted vee bed, inclined to admit a full 17½in. dia. swing by 7½ swing without gap and shed swarf; complete enclosure of screw and shaft; isolation of motor upon opening change wheel guard or locking compartment door, etc.

Write for full details of this advanced machine and of its many PLUS FEATURES.

Also available are Capstan and Copying Models. Ask for complete details



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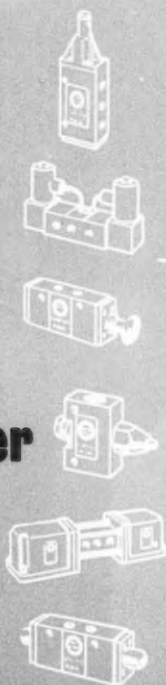
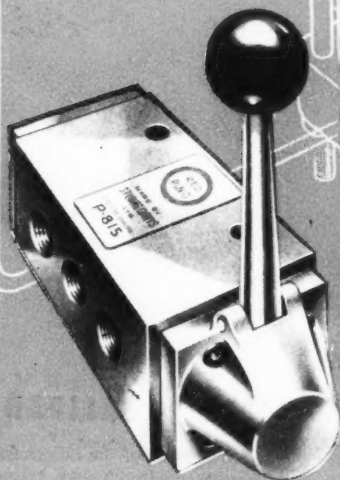
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* RED RING *
Duncan Jones M



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USING A HORSTMANN CALIPER GAUGE

The Horstmann Caliper Gauge incorporates both 'go' and 'not go' gauges in one instrument allowing limits to be checked in a single rapid action. The time saved means no loss of accuracy. Horstmann Gauges are guaranteed for accuracy, hardness and finish to the requirements of British Standard Specifications.

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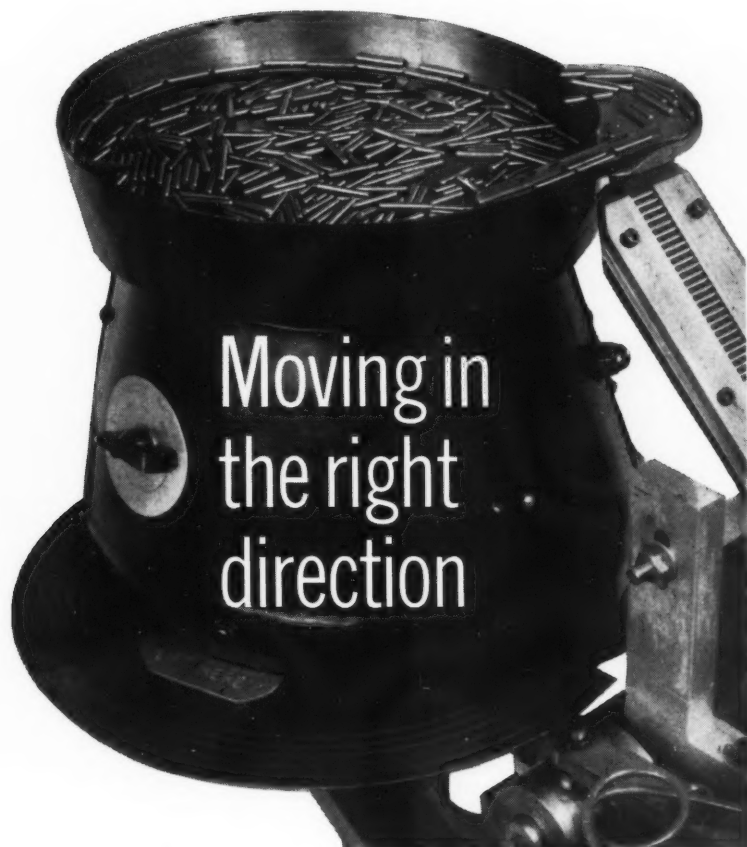
The Horstmann Text House is fully approved by the Ministry of Aviation and the War Office, and it is authorised to certify and release gauges of any manufacture. Enquiries are invited.



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The range of Syntron Electric Vibratory Equipment includes vibrators, feeders, feeder machines and packers for use with powders, gravels and similar materials. Full details on request.

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WITH GOOD REASON—

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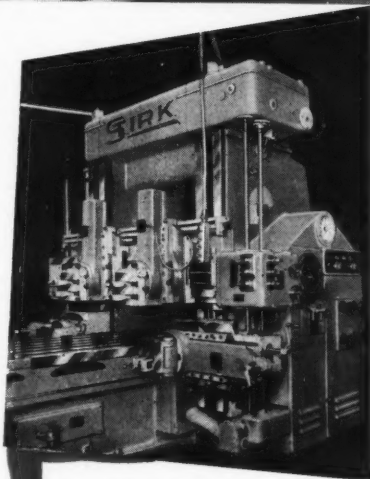


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The modern Stirk Planer, with built-in electrical equipment, possesses many distinctive features which make it one of the world's finest planing machines.

The easy control and fine accuracy of the modern planing machine is due in no small measure to the continuous development of Stirk Planers. For more than fifty years Stirk Planers have influenced the design and set the standard by which others are judged.

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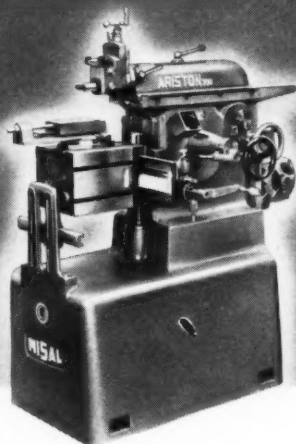
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12" 16" 20" 24" 30" & 35" Stroke

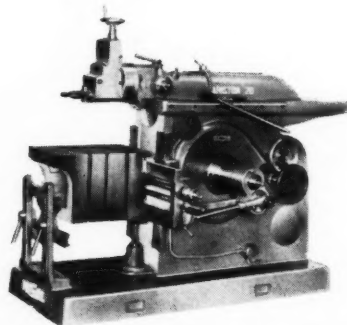
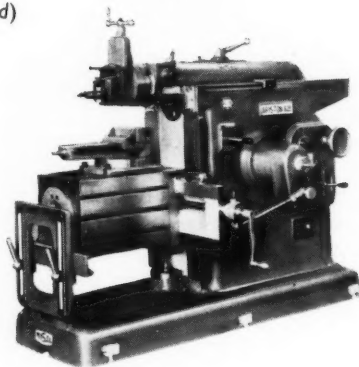


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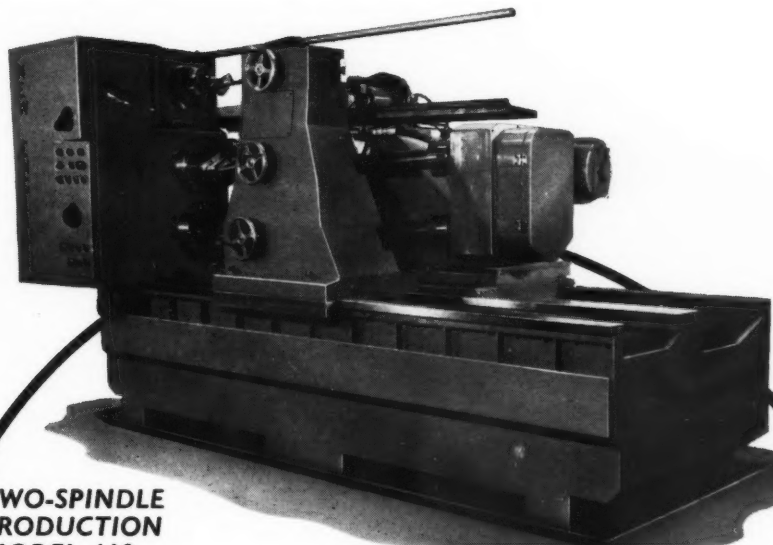
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**TWO-SPINDLE
PRODUCTION
MODEL 110**

NEW ENGLAND AIRFOIL MILLING MACHINE

This newly-designed two-spindle production airfoil milling machine is an extremely large, rugged, heavy and high speed machine, capable of handling the stock removal, in one cut, from either very rough forgings—or from bar stock—to the finished shape.

The machine is particularly applicable for economical production of medium and large steam turbine blades, industrial gas turbine blades, and large compressor and turbine blades for jet engines.

Capacity permits the milling of blades up to 12in. chord width by 60in. length of foil shape.

Designed and manufactured by The New England Machine and Tool Company of Connecticut, and sold by Pratt & Whitney Company, for whom we are Sole Agents in the United Kingdom.

Also available Model
102—6in. and 107—
12in. Electronic
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Machines.

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improved results by use of Purolator filters

In drawing $\frac{3}{4}$ " tubing for refrigerators Accles & Pollock use a specially developed oil in the drawing head.

Purolator bulk filters remove the scale and other abrasives from the oil, and effect a considerable saving in the operations involved.

In circle: The Purolator filter.

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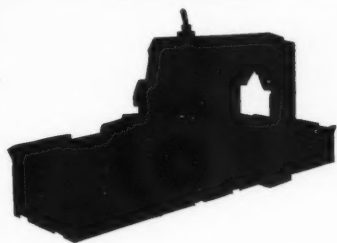


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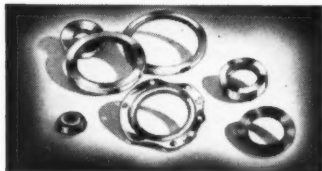
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Whatever your oil sealing problem there is sure to be a SuPerfect solution. Our many years of practical experience in dealing with oil sealing problems for the machine tool industry have resulted in our extensive range of rotary shaft seals, face type seals, hydraulic packings and 'O' rings. SPECIFY SUPERFECT AND BE SURE



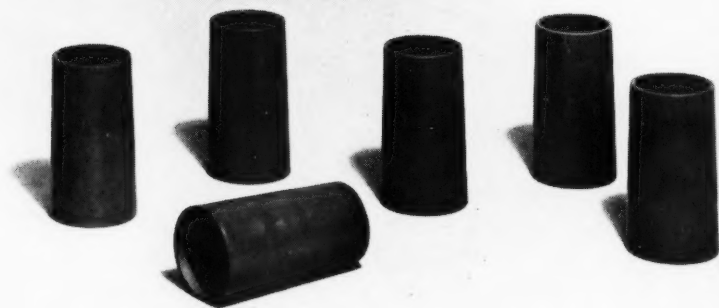
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Castle FIBRE is light and strong
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strength 25,000 lbs. p.s.i. — and it
is resilient, yet ageless.*



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Operation is completely automatic and an electric skip hoist with vibrator feed is available to facilitate loading. The smallest machine in the range, size '00' is shown above, and the compact design and small amount of floor space required can be appreciated from the illustration.

These Dawson machines are ideal for the automatic cleaning of parts prior to metal finishing. Other Dawson machines operate on the conveyor system for flow-line cleaning of larger components and there are Ultrasonic Cleaners for the superfine cleaning of intricate parts.

Write today for details of Dawson Automatic Cleaning Machines and mention the type of application in which you are interested.



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Member of the Asquith Machine Tool Corporation

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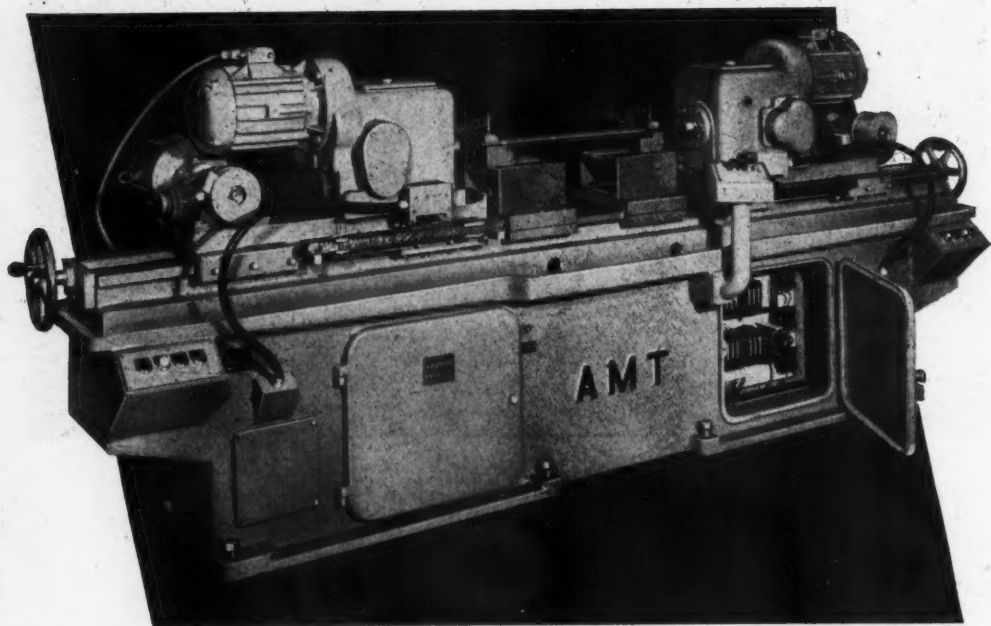
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AMT UNIT HEADS

**INCORPORATED INTO A VERSATILE
2-WAY DRILLING MACHINE —**



Photograph by courtesy of Accles and Pollock Ltd.

Double Ended Machine incorporating two A.M.T. DI Units of 2 H.P. Capacity, each unit separately adjustable on the base to accommodate lengths of components up to 48 inches in length. Each unit can be individually or collectively operated on the following cycles:

**DRILLING, COUNTERBORING, JUMP GAP
DRILLING AND TAPPING**

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'HABIT'**The 'TENNER'****MALE & FEMALE
RADIUS DRESSING
FIXTURE**

A simple, sturdy, reliable radius dressing fixture, fully protected against dust, and accurate to close commercial limits.

The 'Tenner' has no frills, but can be relied upon to give good service over a long period.

The name 'Habit' is a guarantee of quality irrespective of price.

CAPACITY**TEN/TWENTY**

0 — 3in. Female } radii on
0 — 3in. Male } wheels up to
8in. dia.

TEN/FIFTY

0 — 3in. Female } radii on
0 — 3in. Male } wheels up to
12in. dia.

OPERATION

By direct motion from handwheel
check stops at 90° and 180°.

SETTING

By gauge blocks, height gauge
or micrometer.

FITTING

Can be held by magnetic chuck,
vice or clamping to bed directly

PRICE

TEN/TWENTY £12

TEN/FIFTY £15

Ex works
London

Postage, container and packing inland 5/-.
Suitable diamond Tool 50/-.



*in 2
sizes*

A GREAT LITTLE FIXTURE

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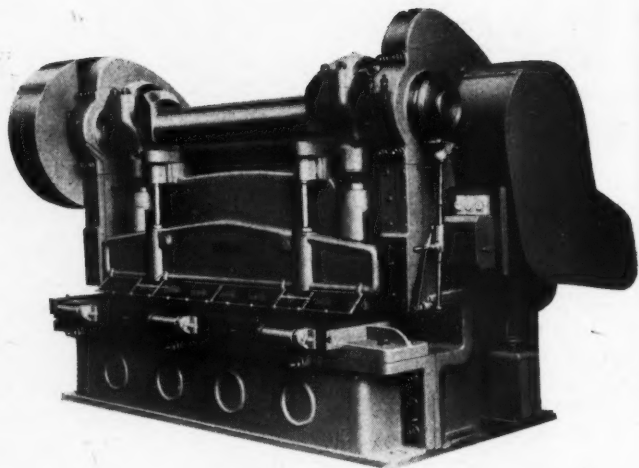
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NEW HEAVY PLATE MACHINES EX LONDON STOCK

This is an exceptional offer of two very fine machines which can be inspected at the FJE Machine Centre in London.



The guillotine is illustrated

$\frac{3}{4}$ in. capacity **GUILLOTINE** with a cutting width of 8ft. 4 $\frac{3}{4}$ in. Complete with hold-down and calibrated rack and pinion adjusted back gauge.

200 tons PRESS BRAKE with a forming capacity in mild steel of $\frac{1}{2}$ in. by 13ft. 11in. over a 2in. vee die opening, or $\frac{1}{2}$ in. by 65in. over a die opening of 4in. All steel construction.

Both machines are motorised for 415 volts, 3 phase, 50 cycles supply.

Fuller details are available on illustrated specification sheets; please ask for copies.

F.J. Edwards Ltd

EDWARDS HOUSE, 359-361 Euston Road, London, N.W.1.
 Telephones: EUSTON 5000. Telegrams: Bescotools London N.W.1.
 Telex: 24264 A/B Bescotools Ldn.
Lansdowne House, 41 Water Street, Birmingham 3.
 Telephones: CENTral 7606-8 Telegrams: Bescotools Birmingham 3.

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**Superb
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Attractive
price
Quick
delivery**

All models complete with Standard Equipment including :

- Cos-par Universal Dividing Head
- Vertical Milling Attachment
- Arbor
- Front Support Braces

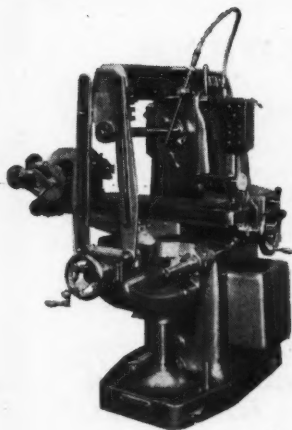
Specification :

	0	1	2
Table	34" × 8½"	39½" × 9"	48" × 11"
Long. Trav.	20"	26"	29"
12 Speeds	32-1000	60-1200	40-2000
Spindle Nose	No. 40	No. 40	No. 40
PRICE ★	£880	£1100	£1825

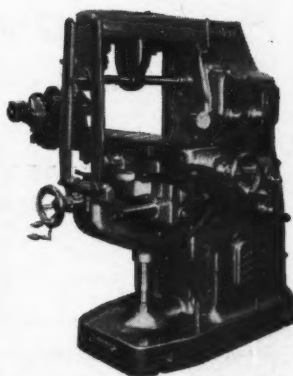


UNIVERSAL MILLING MACHINES

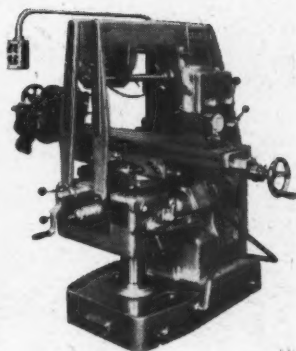
Model 0



Model 1



Model 2

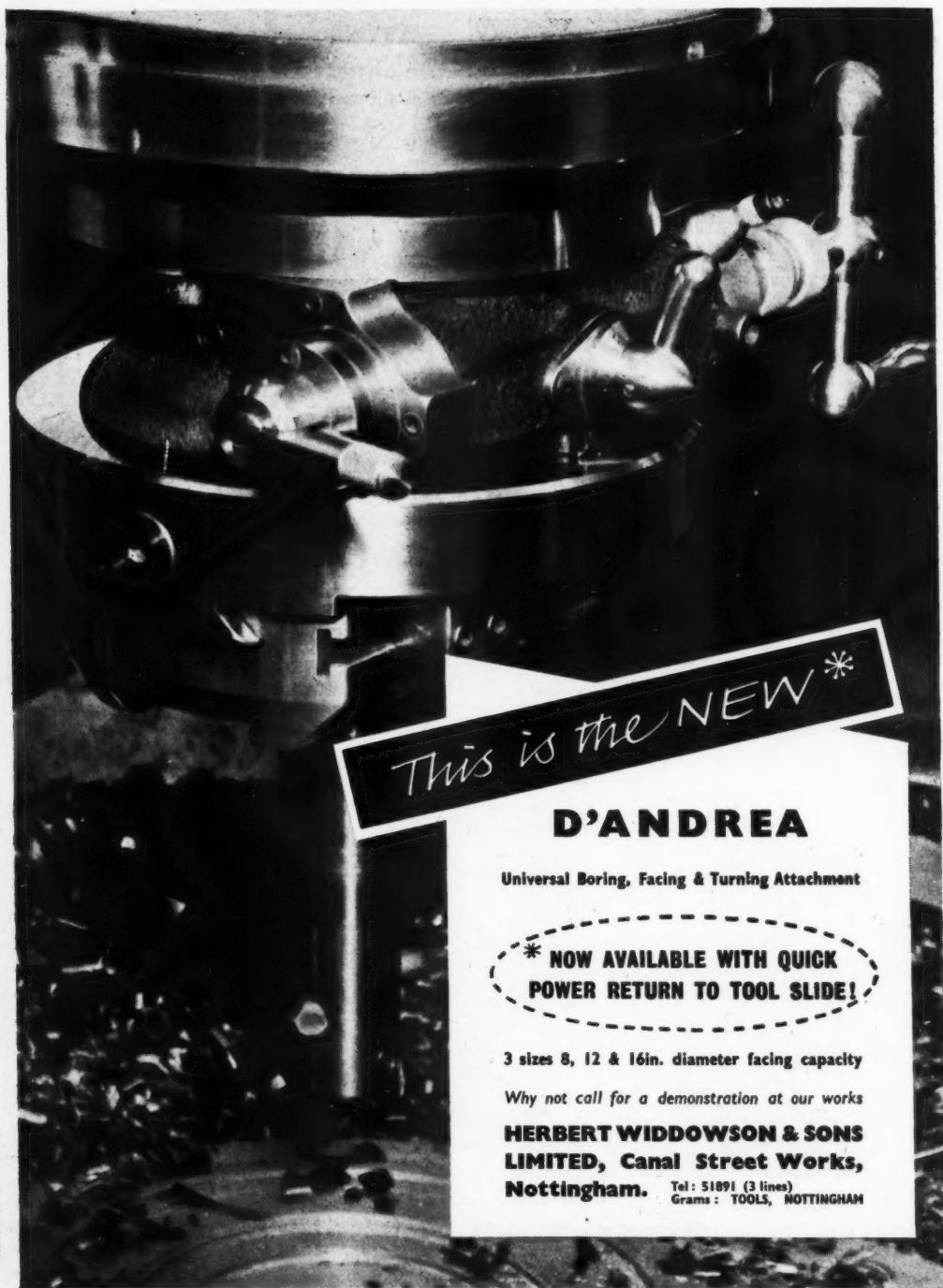


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D'ANDREA

Universal Boring, Facing & Turning Attachment

*** NOW AVAILABLE WITH QUICK
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3 sizes 8, 12 & 16in. diameter facing capacity

Why not call for a demonstration at our works

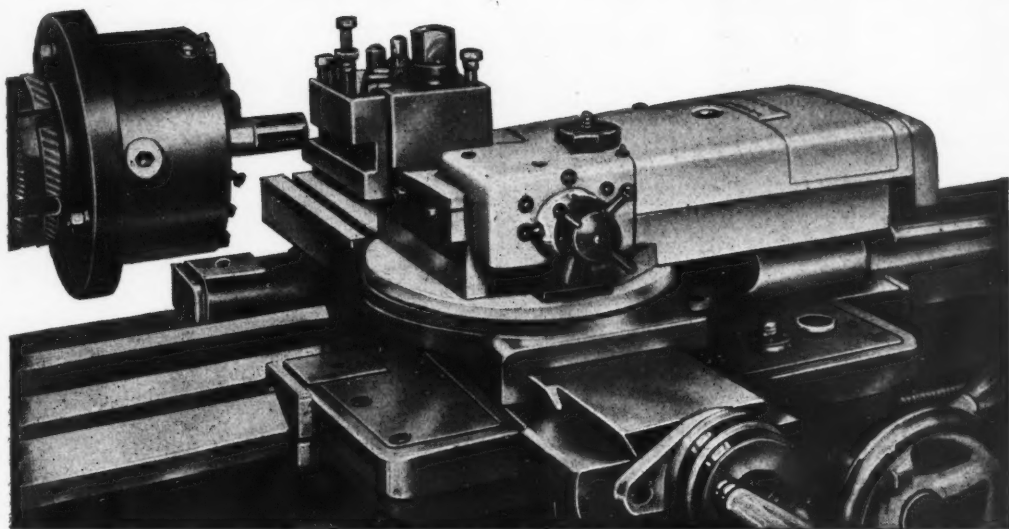
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high speed THREAD CUTTING ATTACHMENT



**Write today
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details of this
revolutionary
attachment**



- ▶ **FITS ANY CENTRE LATHE**
- ▶ **CUTS ANY THREAD...
INTERNAL OR EXTERNAL
CYLINDRICAL OR TAPER**
- ▶ **MAXIMUM LENGTH 1½ in.
MAXIMUM PITCH 5. T.P.I.**
- ▶ **THREAD RIGHT UP
TO A SHOULDER...
INSTANT WITHDRAWAL**
- ▶ **EQUALLY SUITABLE FOR
SHORT RUNS OR
LARGE SCALE PRODUCTION**

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CANAL STREET WORKS . NOTTINGHAM . ENGLAND

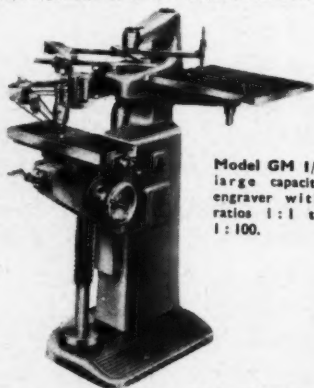
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Model GM 11a/1
a heavy duty engraver with ratios 1:1 to 1:10. Can also be used as a light vertical milling machine.

EQUIPMENT includes:

- Device for engraving from drawings
- Cylindrical engraving attachment
- Saucer engraving attachment
- Electric etching attachment
- Form engraving attachment



Model GM 1/1
large capacity engraver with ratios 1:1 to 1:100.

Bring your engraving problems - we have the answer!

Kuhlmann

MACHINES

... cover every engraving need!



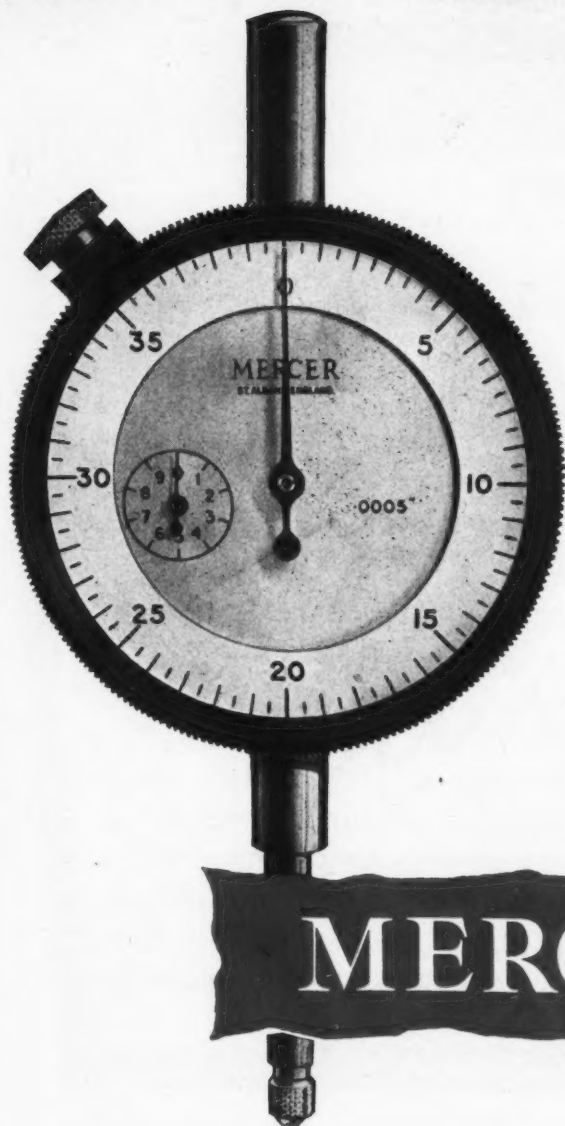
Model GMO 3D
a 3 dimensional machine of high efficiency. Ratios 1:2 to 1:8.

Kuhlmann Engraving Machines are the result of over 50 years' specialist development. Every aspect of engraving has been investigated and a corresponding solution found. The accessories for the range of machines are interchangeable which results in the greatest versatility at lowest cost.

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ENGINEERING Co. Ltd.

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Dial Gauges

- ◆ Mercer offer the most complete range of dial gauges in Europe.
- ◆ Absolute reliability and accuracy.
- ◆ Comprehensive repairs and spares service available.
- ◆ There is a department devoted exclusively to special applications, where your individual problems can be investigated and solved.

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Scottish Office: J. F. Tennent Ltd., 52, St. Enoch Square, Glasgow, C.I.



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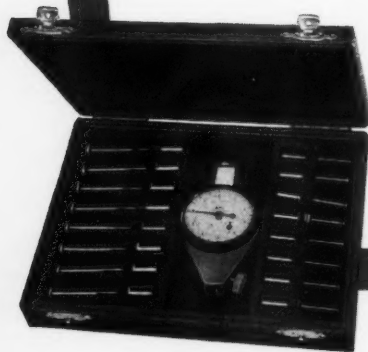
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Measurement . . .

the **JOHN BULL**
'MINICHECK'

A BRITISH MADE precision
instrument of superlative
accuracy and reliability.

The MINICHECK has a diameter

coverage of $\frac{1}{8}$ " - $\frac{1}{2}$ " and is avail-
able as a complete unit, or
with any single mandrel or
selection of mandrels
from the range. Full data
will be supplied on request.



WIDER RANGE OF MANDRELS
NOW AVAILABLE UP TO 0.500"



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Cleaner conditions for **CLEAN AREAS**

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Sturtevant **PLANT**

Sturtevant plant provides and maintains the cleanest air and best conditions for clean areas with:—



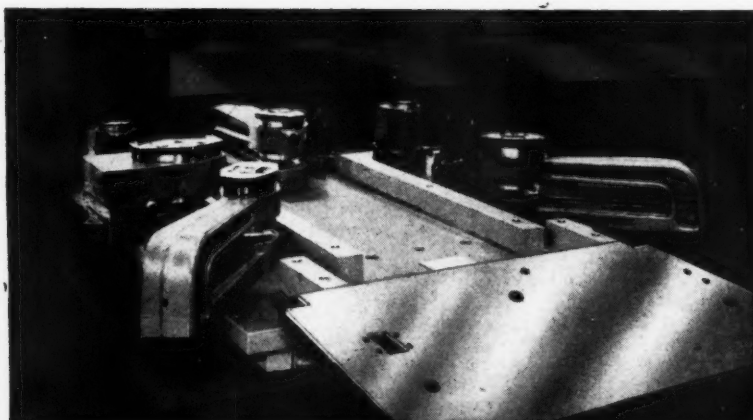
- Air filters capable of removing airborne particles down to 0.01 micron or finer.
- Plenum heating plant, with or without close control of temperature and humidity.
- Vacuum cleaners for dustless cleaning of all surfaces, components and machinery.

Enquiries to our reference Z/101/MY

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AUSTRALIA: STURTEVANT ENGINEERING CO. (AUSTRALASIA) LTD., MILLER ROAD, VILLAWOOD, N.S.W.

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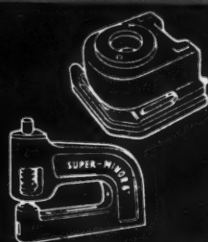
*** MULTI-PIERCING AND NOTCHING NOW POSSIBLE WITHOUT SPECIAL PRESS TOOLS !!**

REDMAN UNITOOL SYSTEM

(PATENT NOS. 639079 & 647163)

With Redman UNIPERCE and UNICROP units, multi-punching and notching set-ups can be quickly positioned on baseplates, thus not only enabling production to start without delay, but also saving the cost of special tools. Catalogue UP/1002/M3 on request.

REDMAN TOOLS & PRODUCTS LTD., Box No. M.3, Gregory's Bank, Worcester.
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THIS MACHINE DOES THE WORK OF 4 TAKES UP THE SPACE OF 1

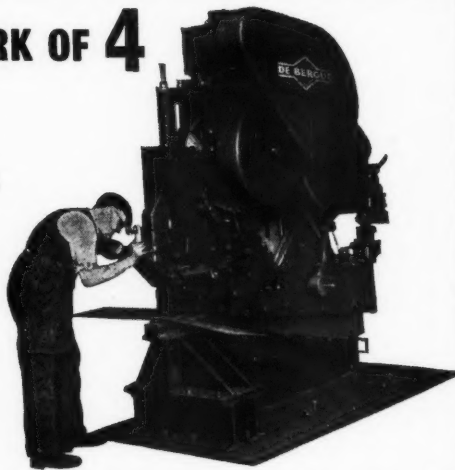
- PUNCHING
- SECTION CROPPING
- PLATE SLITTING
- NOTCHING

BERGUE 4 IN 1

MULTI-PURPOSE MACHINE

SEND FOR BROCHURE (M)

Made in several sizes, these robust machines with recent improvements in design are an invaluable asset to constructors in STEEL.



A new range of Guillotines of modern design will shortly be available. Full particulars on request

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Telephone: EAST 2771

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A perfect team



Team your electric motor with a Renold chain and reap the benefit of the only drive with 98½% proved efficiency. Compact and non-slip, a Renold chain drive preserves a definite ratio and relationship between the driven and driving shafts and maintains its efficiency throughout its speed range. Unaffected by atmospheric conditions, there is no initial tension—no pull on shaft bearings—and it is available for transmitting the full power of the electric motor immediately on starting up.

RENOLD chains go
with
electric
motors



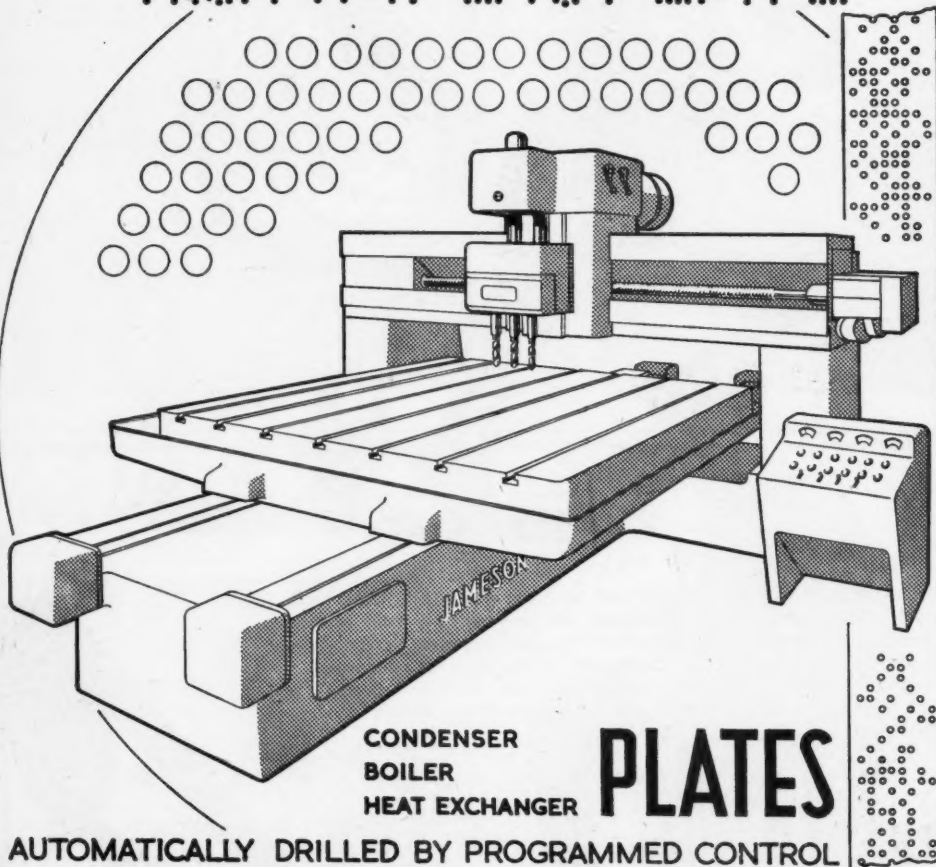
RENOLD CHAINS LIMITED • MANCHESTER

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JAMESON

TUBE PLATE DRILLING MACHINES

FROM TAPE TO PLATE



CONDENSER
BOILER
HEAT EXCHANGER

PLATES

AUTOMATICALLY DRILLED BY PROGRAMMED CONTROL

- SINGLE OR MULTI-SPINDLE DETACHABLE HEADS
- CENTRES TO SUIT YOUR HOLE PATTERN
- LEVER SPEED & FEED CONTROLS
- NO PICK OFF GEARS

Please send drawings of your plates to us.

SPECIAL MACHINE TOOLS

designed and made to meet individual requirements up to 150 tons.

TRAVELLING COLUMN MILLING & BORING MACHINES
FINE BORING MACHINES

SPECIAL

{ LATHES, MILLS, GRINDERS, BORERS, PLANERS
PLANO-MILLS, BROACHING MACHINES
DRILLING MACHINES AND UNIT HEADS

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Head Office: West St. Works, Ewell, Surrey. Phone: Ewell 4747
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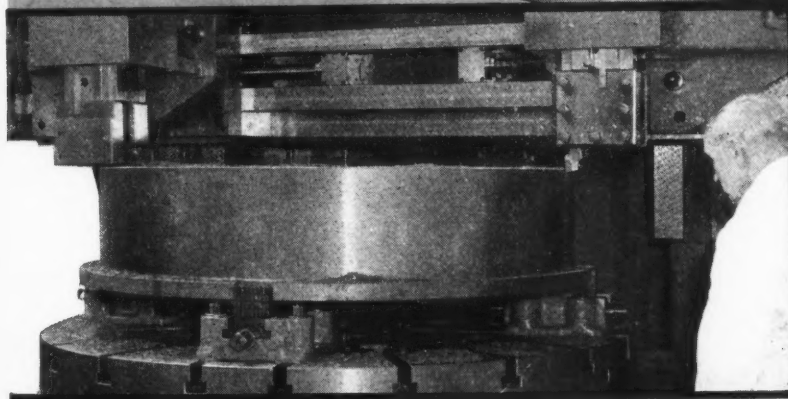
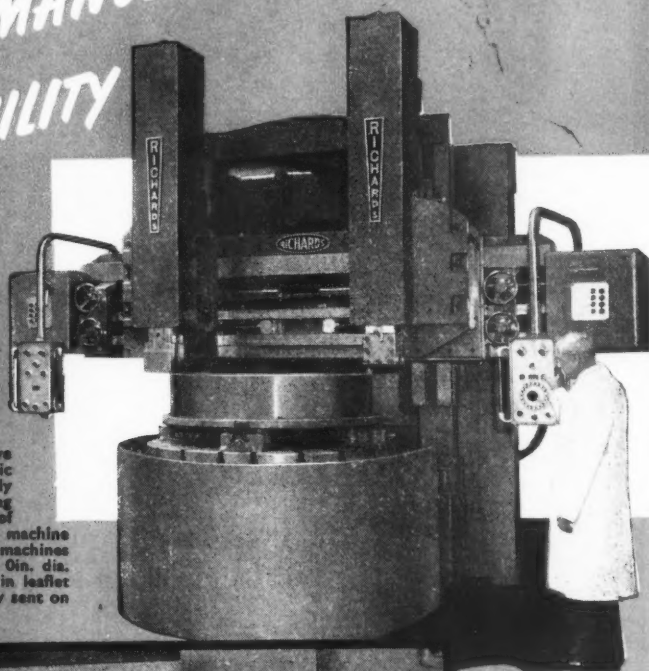
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ACCURACY — PERFORMANCE plus RELIABILITY

Richards Vertical Boring and Turning Mills, renowned for their high standard of accuracy, performance and reliability, are backed by 80 years' experience. They have many outstanding features: sturdy construction incorporating internal ribbing, giving rigidity under the heaviest of cutting conditions; automatic pre-start lubrication; pre-selective speed change through electro-magnetic clutches; vertical tool rams, hydraulically balanced; automatic hydraulic clamping of cross-slide; 30° angular movement of rams, either side of vertical. The machine illustrated is representative of a range of machines with a work table of 5ft. 0in. to 10ft. 0in. dia. The machine is more fully illustrated in leaflet No. 102, a copy of which will be gladly sent on request.



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GEORGE RICHARDS & CO. LTD. BROADHEATH · ALTRINCHAM · CHESHIRE
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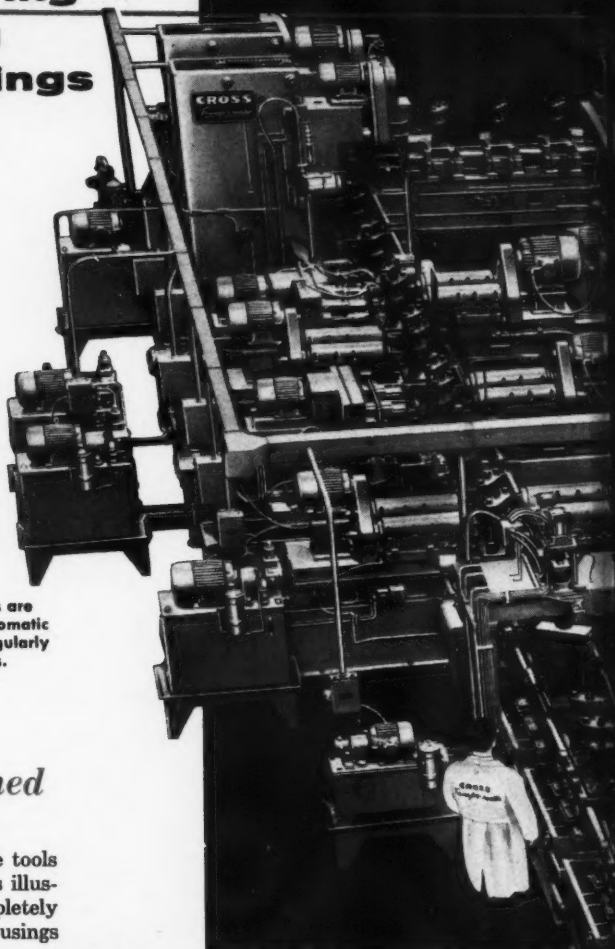
R116C

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Milling, Drilling, Boring and Assembling Steering Gear Housings



Close tolerances are maintained in automatic processing of irregularly shaped parts.



New Transfer-matic Designed to Prevent Obsolescence

A typical example of how transfer type machine tools can be designed to guard against obsolescence is illustrated by this new Cross Transfer-matic. It completely machines and assembles power steering gear housings except for the mounting feet.

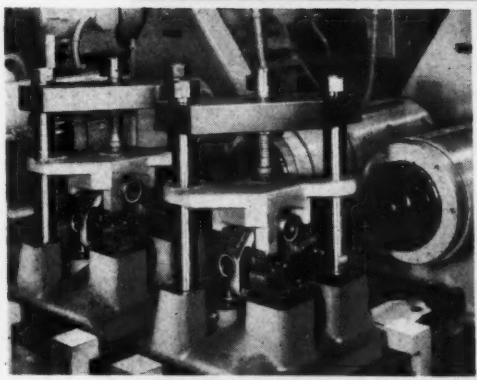
Useful life has been materially increased by building the Transfer-matic to process housings with longer pitman shaft extensions than those now being produced. Three idle stations permit other operations to be added and the use of standard Cross "building blocks" provides further flexibility for part design changes.

Present operations include milling, drilling, boring, counterboring, spot facing, chamfering, tapping, deburring, and assembling the worm thrust bearing cups and the pitman shaft bushings in the housings. Rated production is 300 pieces per hour.

A special feature is the provision for off-line inspection of the pallets and the parts without loss of production.

Another feature is the provision for in-line inspection at three different stations and final inspection just before the assembly operations.

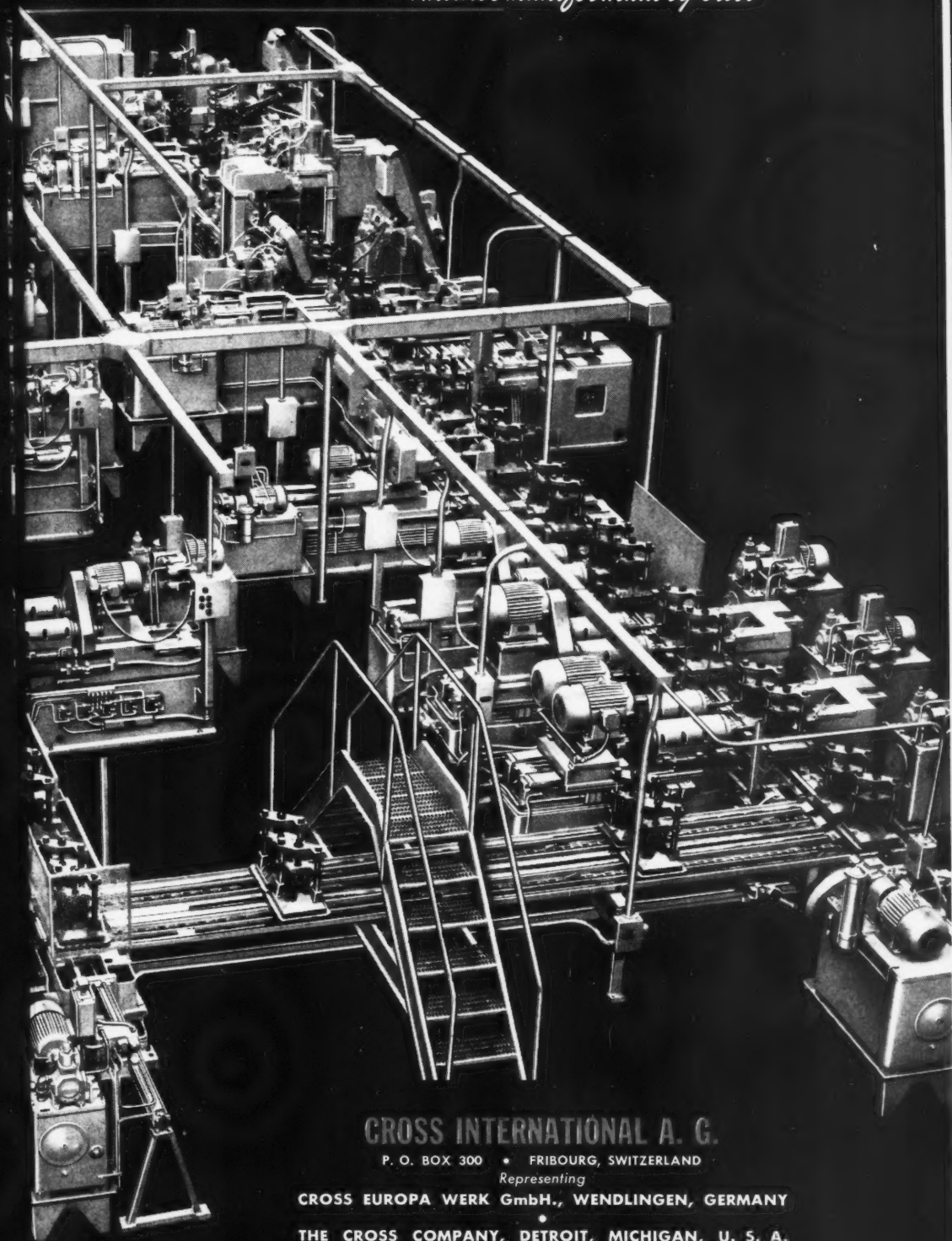
If you would like to know more about these and other Cross innovations, just drop us a line.



Precision boring of the worm shaft hole—two at a time.



Another Transfer-matic by Cross



CROSS INTERNATIONAL A. G.

P. O. BOX 300 • FRIBOURG, SWITZERLAND

Representing

CROSS EUROPA WERK GmbH., WENDLINGEN, GERMANY

THE CROSS COMPANY, DETROIT, MICHIGAN, U. S. A.

THE BIG PEOPLE

for

MACHINE TOOL
REBUILDING

are...

Newman

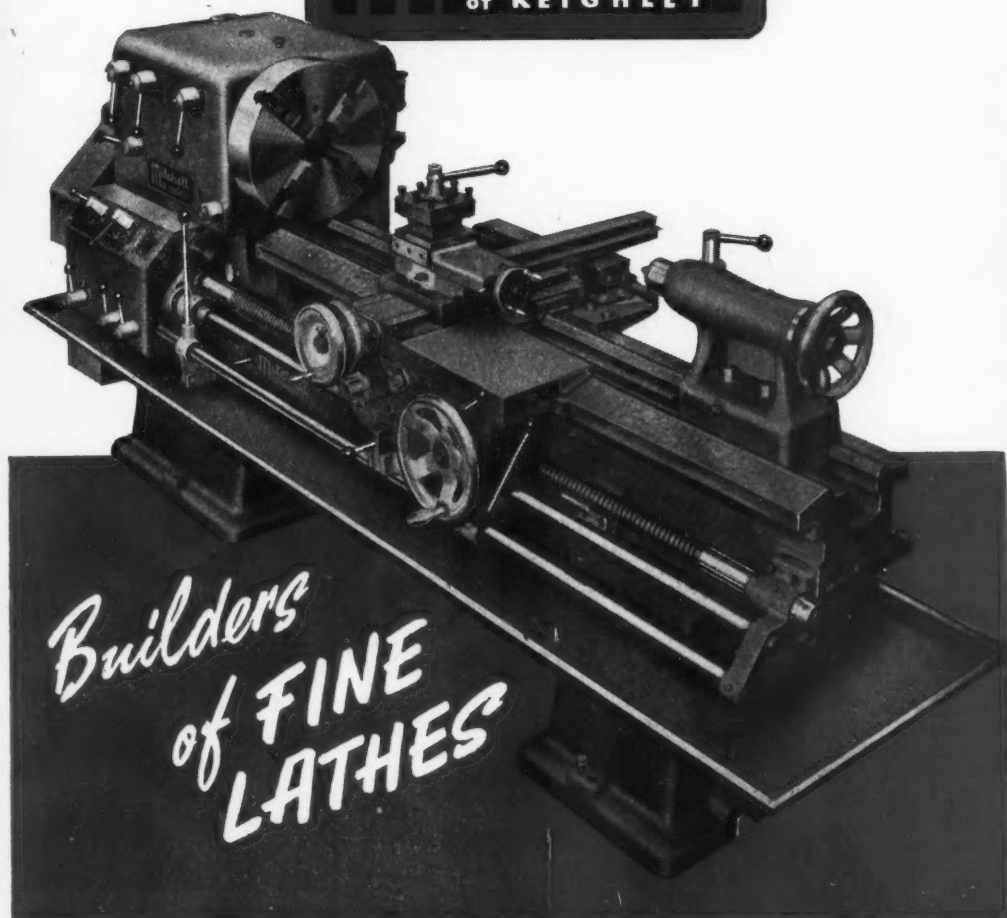
OVER A
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A CENTURY'S
EXPERIENCE

NEWMAN INDUSTRIES LIMITED

YATE · BRISTOL · ENGLAND

Telephone: Chipping Sodbury 3311

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*Builders
of FINE
LATHES*

FROM 6 $\frac{1}{2}$ " TO 16 $\frac{1}{2}$ " HEIGHT OF CENTRES

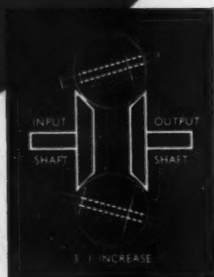
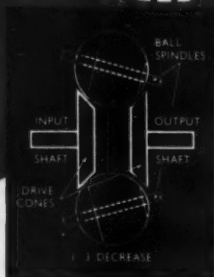
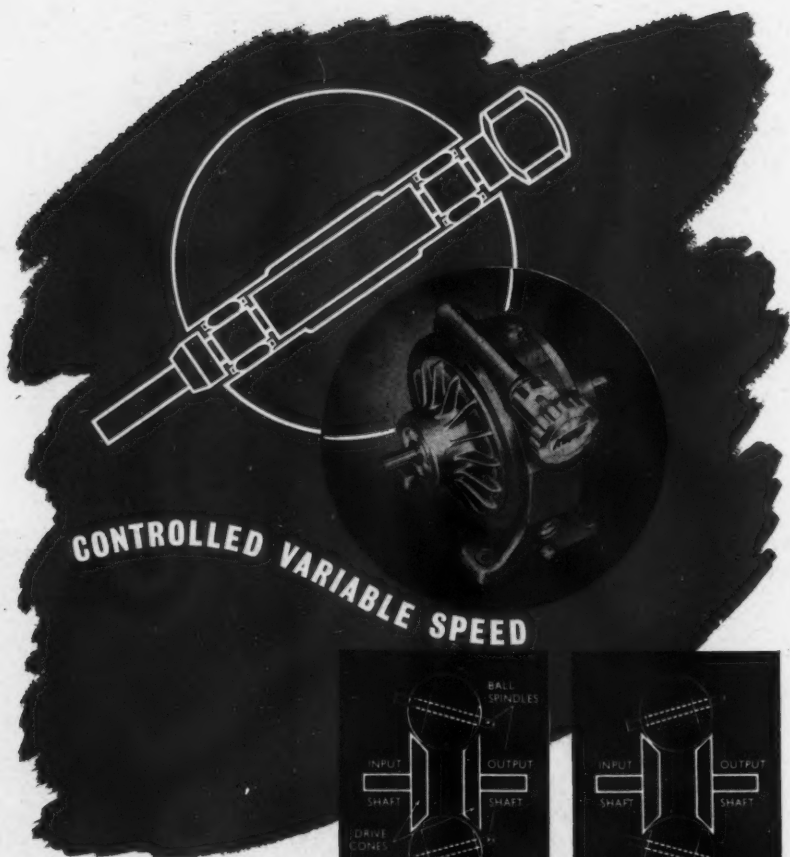
These machines are built out of a long tradition of craftsmanship to the highest modern standard of design, productive capacity and precision. There are sizes and types to meet your own needs. Ask us to send you details.

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Telephone: Keighley 4283

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**Technical
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- Range $\frac{1}{3}$ h.p. to 15 h.p.
- 9 to 1 stepless speed variation.
- Flange mounted motors (when required).
- Flange mounted Reduction Gears for low output speeds.
- Exceptionally light, sensitive, and accurate control of speed settings by handwheel, pneumatic, mechanical or electrical remote control.

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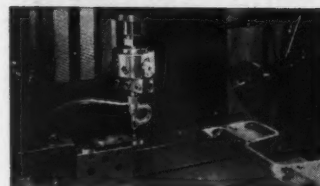
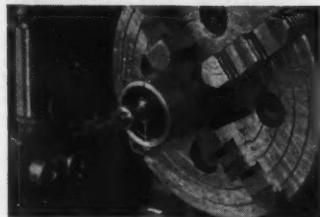
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THE
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AIROTOR
 is here!



300,000 RPM

A revolutionary industrial tool for ultra high speed removal of metal and other materials to precision tolerances.



The Ashcombe Airtor is an air-driven instrument operating at a spindle speed in excess of 300,000 r.p.m. This speed develops the full efficiency of small carbide burrs in a field never before used or known. It is possible now to machine the very hardest tool steels, carbides, ceramics, chrome, glass, plastics etc. to close tolerances using inexpensive carbide, diamond and abrasive tools. The high operating speed dissipates all heat from the instrument and from the material being worked, and there is no tendency for the burr to 'climb'. The Ashcombe Airtor can be used as a hand tool, or easily adapted for use with Jigborers, Lathes, Milling Machines, Pantographs or in special 'set-ups'. The Airtor head itself is only $\frac{1}{8}$ " diameter and $\frac{1}{4}$ " long, allowing the instrument to reach into confined spaces and openings. A full range of tungsten carbide burrs and diamond mounted points are available for use with the Ashcombe Airtor, which can be operated from an airline providing a pressure of 40 lbs. p.s.i.



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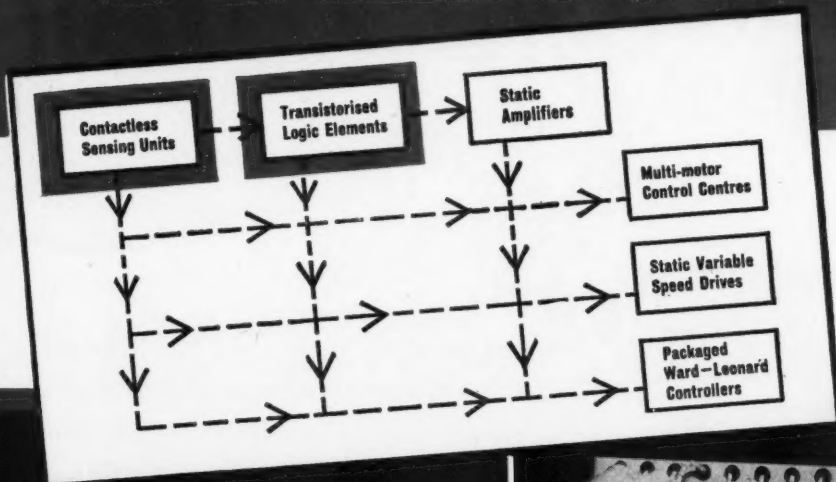
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Sole selling agents in Europe

'UNISTAT'

- static type control schemes
for all industrial processes



'UNISTAT' Contactless Sensing Devices and Transistorised Logic Elements

provide a static method of signal origination, amplification, and electrical switching for operations in the automatic sequencing and control of industrial processes. Simple, robust and flexible, these units provide a high degree of reliability and reduce maintenance requirements. Units are enclosed in a compound for protection against the most arduous atmospheric and industrial conditions. Static switching elements for control schemes can be housed in 'ENGLISH ELECTRIC' Multi-Motor Control Centres.

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Limit, proximity and push-button devices
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6-input AND GATES and 6-input OR GATES

Power amplifiers, Triggers, Memories,
Time delays, Power supplies.

'ENGLISH ELECTRIC'

control gear

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CG.7

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then use

KE LOCK HIGH SPEED STEELS

The steels with consistent quality

All these tools have been made by various well-known manufacturers from KELOCK High Speed Steels—materials used by them over a considerable period and found to be completely satisfactory.

We can offer all the popular qualities, including


KE LOCK 1021 10% Cobalt Tungsten Vanadium Molybdenum High Speed Steel

KE LOCK 237 18% Tungsten Vanadium High Speed Steel (18/4/1)

KE LOCK 795 14% Tungsten Vanadium High Speed Steel

KE LOCK A 157 5% Molybdenum Tungsten Vanadium High Speed Steel (5/6/2)

Available in the form of forgings, discs, blank bars, cold drawn and centreless ground ($\frac{1}{8}$ "–3" diameter only) lengths.



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CARLISLE STEELWORKS, SHEFFIELD 4

TELEPHONE: SHEFFIELD 22124. ESTABLISHED 1825

TELEGRAMS: "KAYSER, SHEFFIELD 4."

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G.26. Heavy duty, high speed grinder with independent drive to each wheel. Can be supplied with dust extraction equipment to C.I.R.A. design, with 20" x 3" or 24" x 3" wheels.

UNION
grinding
machines
WITH WHEEL SIZES
10" x 1" up to
24" x 3"



Union "Jubilee" light duty grinder or polisher. Supplied with polishing spindle in place of one or both wheels if desired.

Double-ended medium duty grinder. Can be supplied with coolant, eye shields, twist drill grinding attachment or arranged for side grinding.

Literature available covers the Harrison range of Lathes from 9in. to 17in. swing; Milling, Drilling and Grinding Machines and Engineers' Accessories.

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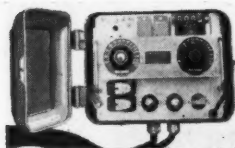
MAC 99

HIGH-SPEED DIE CASTING MACHINE

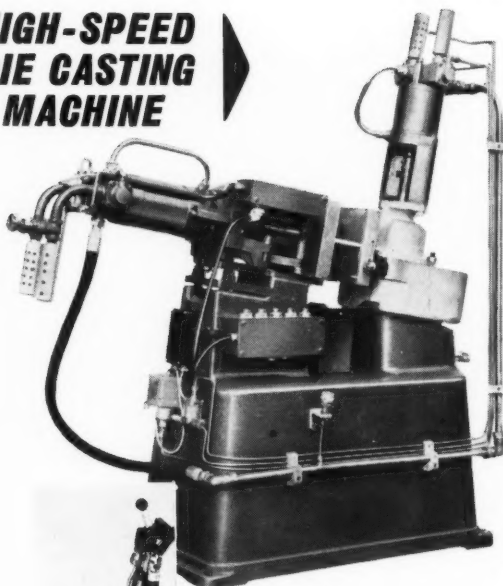
BRITISH AND FOREIGN PATENTS

- **NEW** 4-way adjustable die unit.
- **NEW** brush device (British and foreign patents) cleans and lubricates die faces, adjustable angle—optional extra.
- **NEW** Automatic cycling—optional extra.
- Push button panel
- Removable spacer plate for centre sprue
- Broader and sturdier base
- Solenoid-operated valve system with speed control
- Exhaust mufflers for quiet operation
- Zinc, Tin, Lead Alloys
- Capacity 12 ozs. Zinc Alloy

ELECTRONIC TIMER UNIT



Optional extra—electronic timer unit entirely enclosed in a metal container. Can be attached instantly to the control panel with quick connect plugs, and be placed away from machine.



NEW BRUSH DEVICE

Optional extra—New brush device (British and foreign patents) air operated, cleans and lubricates the die faces. Mounted on a swivel plate to give an adjustable angle to the brush stroke.



DESIGNED ESPECIALLY FOR
DIE CASTING PLANTS

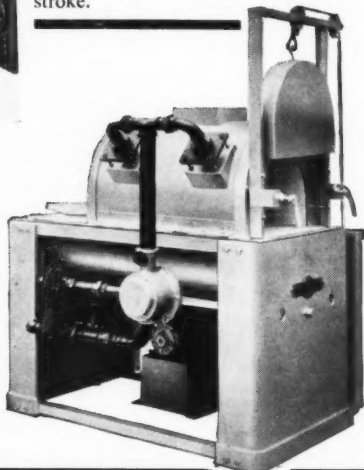
AR/200

200lb. REVERBERATORY FURNACE

500lb. Capacity also available

A complete, self-contained unit for aluminium

No crucible. Minimum Heat Radiated. Low maintenance costs. Low metal loss. Automatic Atmosphere control and bypass. Large cleaning and charging door.



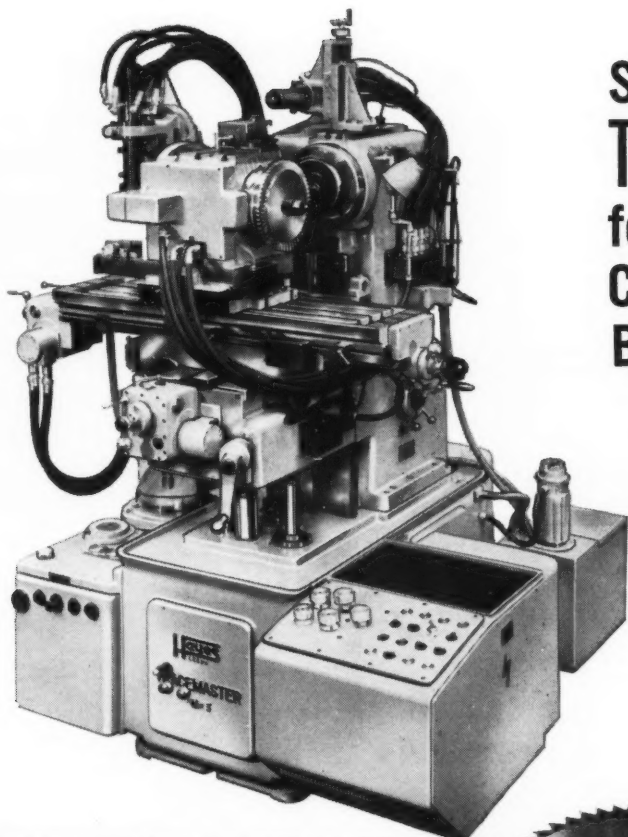
DIE CASTING MACHINE TOOLS LTD., Die Casting Division,

River Works, 152 Green Lanes, Palmers Green, London, N.13, England.
Tel.: PAL 2271. Grams: Diemechs, Wood, London. Cables: Diemechs, London, and at New York, N.Y., U.S.A., and Los Angeles, Calif., U.S.A.

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Red Lane Works, Coventry.
Phone: 89221 (10 lines).

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Special
TRACEMASTER
for
COPY MILLING
BLADES IN SOLID
STEAM
TURBINE
ROTORS

AUTOMATIC CUTTING CYCLE



HAYES ENGINEERS
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GELDERD ROAD, LEEDS 12

Telephone: 30941

'Grams: "Toolmaker", Leeds 12

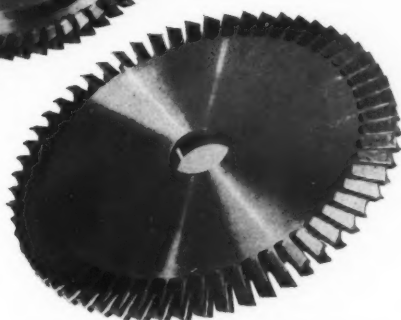
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17 Grosvenor Gardens, London, S.W.1



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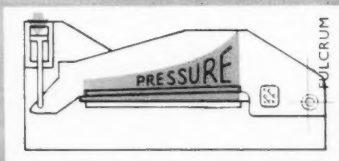
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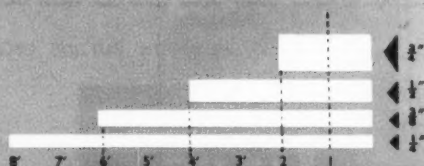
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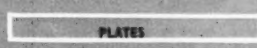
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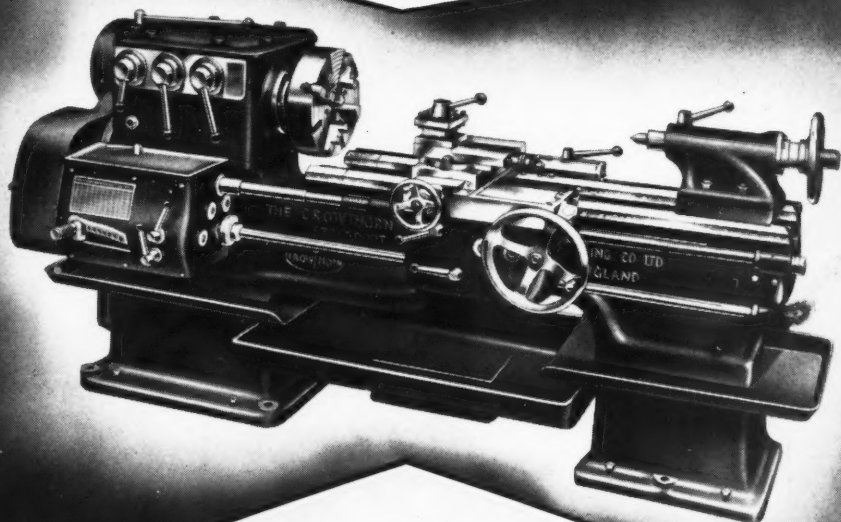
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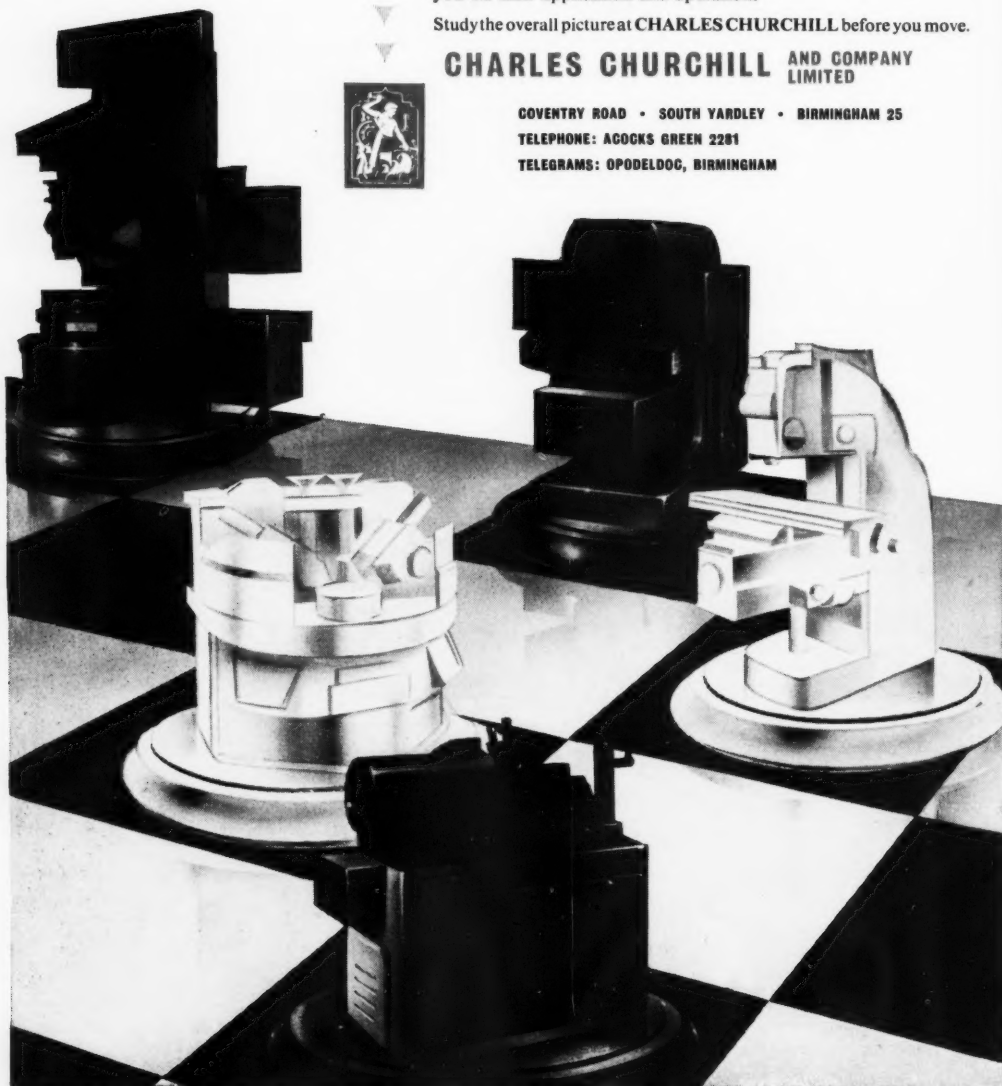
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Abstracts of Principal Articles

The Production of the SIMCA Aronde P. 1104

The paint shop at the new Poissy factory of the French SIMCA organization is located on the first floor at one side of the assembly building. In the section devoted to the painting of small components, there is a flow-coating installation for parts to be finished black, and for coloured components there is a line with four spray booths and conveyorized ovens. Wheels are handled at a rate of 300 per hour by a conveyorized section, with only four operators, and are delivered to a store below where they are mated with tyres, which are fitted on an automatic machine. Body-shells from storage conveyors at the end of the assembly line are loaded on to carriers on an overhead conveyor which forms part of the painting installation supplied by Geo. W. King, Ltd. Provision is made for Bonderizing, the application of a thin coat of black lacquer that assists fault detection, undersealing by dipping, application of an undercoat, and spraying to give one-, two- or three-tone finish. Flow of body shells is automatically controlled, and the flow is divided into two or four lines, as required, to give an output of 80 finish-painted body-shells per hour. (MACHINERY, 98—17/5/61.)

Number Codes P. 1114

After a brief review of the origins of the method of counting most commonly used today, this article deals with the increasing use of the binary code, notably in connection with punched-tape numerical control systems. The theory of the code is discussed, as is a commonly-used refinement, namely the decimal-binary equivalent code. To reduce the possibilities of errors being made by the tape readers incorporated in numerically-controlled machine tools, special code arrangements are employed to provide for differentiation between dimensional and management information, for example. Another method is to include "redundant" information in the form of signals which separate successive blocks of instructions punched on the tape. (MACHINERY, 98—17/5/61.)

East German Machine Tools at the Leipzig Fair P. 1119

This article gives details of some special machines and measuring instruments shown by the East German machine tool industry at the recent Leipzig Spring Fair. An automatic billet cropping, heating and forging line—part of a larger installation—for cutting off billets from 3·5-in. square bar, induction

heating, and 2-stage forging, for the production of pipe flanges at the rate of 720 per hour, was demonstrated in operation. Another automatic line provided for the production of container lids from tinplate at the rate of 300 per min., and included a newly-designed, automatic feed press equipped with two blanking and drawing tools, serving four edge-rolling machines. Automatic closing of the ends of large oil drums by means of hydraulically-operated forming rollers was also shown. An instrument for measuring small bores down to 0·002 in. diameter was on view, also a helix angle tester for gears. (MACHINERY, 98—17/5/61.)

Some Aspects of Marine Engine Building Practice P. 1127

The engine works of Harland & Wolff, Ltd., Belfast, are impressive from the standpoints of size and the wide range of machines and equipment installed. The main bay of the engine machining and erection shop measures 1,090 ft. long by 84 ft. wide by 67 ft. high, and is served over its full length by travelling cranes, some of 80 tons capacity. In this article, a number of set-ups is described, including planing, grinding and milling operations on such components as large connecting rods, eccentric straps, and exhaust piston tie rods. Attention is also drawn to the company's facilities for hobbing and shaving double-helical reduction gears up to 15 ft. diameter on machines supplied by The Power Plant Co., Ltd. (MACHINERY, 98—17/5/61.)

Japanese Machine Tool Factories . . P. 1133

This ninth and penultimate article in a series describing some of the more important Japanese machine tool factories, is concerned with the activities and products of the Tsugami Manufacturing Co., Ltd., whose main factory is at Nagaoka, near the Japan sea coast. The company builds a range of machine tools including thread rolling machines, automatics, and cylindrical grinders, and produces a variety of precision tools including gauge blocks. Machine tool castings are made in the company's foundry, and there are good facilities for stabilization by heat treatment. A newly-installed, Japanese-built, spark-erosion machine, is employed for cutting slots in guide bushes for automatics. Brief details are given of the methods employed for gauge block production, including stabilization by low-temperature treatment, and some typical machine tools produced by the company are described. (MACHINERY, 98—17/5/61.)

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If you know of a more efficient way of designing a tool, gauge, fixture, or mechanism, machining or forming a metal component, heat treating, plating or enamelling, handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department or a factory, send it to the Editor. Short comments upon published articles and letters on subjects concerning the metal-working industries are particularly welcome. Payment will be made for exclusive contributions.

EDITORIAL

Commonwealth Technical Training Week

As is now generally known, Commonwealth Technical Training Week, which owes its origin to the inspiration of H.R.H. The Duke of Edinburgh, and has been admirably organized by the City and Guilds of London Institute, of which he is President, will be held in this country and in many other areas during the period from May 29 to June 4. For various reasons it was found desirable to select earlier or later dates in certain territories, but such lack of synchronization need in no way detract from the value of this farsighted project. As soon as the plan was announced, its inherent appeal brought an enthusiastic response, and in view of the numbers of events that have been arranged in all the areas concerned, it is evident that there is a widespread appreciation of the vital importance, both for the individual and the community, of providing better facilities for training in the future.

Despite the use of the word "technical" it is emphasized that the purpose of the scheme is very broad and it is by no means intended that it should be confined to apprenticeship schemes and other forms of industrial training. On the contrary it has been interpreted as embracing all kinds of vocational training and education, for example, for agriculture, commerce, and the professions. Primarily, the object, as stated by the organizers, is "to make the entire Commonwealth aware of our joint responsibility towards the young man or woman trying to find a niche in life." Clearly, then, if the training week is to fulfil its purpose, it must have the effect of focusing the attention of those within whose power it lies on the desirability of affording better and more numerous opportunities for instruction in a great diversity of fields, to supplement the activities of purely educational establishments. Greater efforts must also be made, on the lines of those that will characterize the "week," to ensure that these opportunities are widely known in order that a greater number of people may follow careers for which they are fitted by inclination and aptitude. Finally, in the words of Prince Philip, it is to be hoped that the occasion will enable the general public to "get to know a bit more about the training for the technical skills which make their modern standards of living possible."

Although, as has been pointed out, the appeal of training week is to be very broadly based, it is evident that there is a particular need for a rapid increase in the numbers of well-qualified engineers

and engineering technicians in all the territories of the Commonwealth. A clear picture of the immense combined resources of these territories was presented in the Seventh Graham Clark Lecture which was delivered recently by Prince Philip to a joint meeting of the Institutions of Civil, Mechanical, and Electrical Engineers. The existence of many of these resources has, of course, long been known, but their exploitation, by modern standards, may appear to have been painfully slow. With rising populations and a growing appreciation of the possibility and desirability of improving standards of living for people everywhere, it is essential that the rate of progress should be greatly accelerated.

The resources exist, and of recent years there has been a spectacular increase in knowledge of ways in which they can be turned to practical account. In all the stages of advance, however, engineers must necessarily play a vital part. Obviously one of the most urgent requirements in many areas is more ample supplies of power, and in this connection some striking figures were quoted in the Graham Clark Lecture to which reference was made above. It was pointed out that whereas the Commonwealth accounts for 24 per cent of the world population, and 23 per cent of the land area, energy production in these territories amounts to no more than 12 per cent of the whole. No less striking are the inequalities of energy supply at present available in different areas, as is indicated by the figures for consumption per head of "commercial" sources, expressed in metric tons of coal equivalents, which range from 5.187 in Canada and 4.741 in the United Kingdom to 0.06 in Pakistan.

To enable energy supplies to be increased and applied in many ways, by techniques which are already well known, to permit the effects of human labour to be multiplied, very heavy capital expenditure will be required. Of no less importance, however, will be the availability, in sufficient numbers, of adequately trained people who can direct the processes of industrialization and mechanization and ensure that efforts are not dissipated. With the necessary competence and outlook such people will assist in overcoming material obstacles that might otherwise delay progress for decades. At the same time, they will be afforded the opportunity of careers of unlimited promise and

(Continued on page 1157)

The Production of the SIMCA Aronde

Methods and Equipment Employed for Painting Body Shells
for this Popular French Car in the New Works at Poissy

By P. A. SIDDER, Chief Associate Editor

PRODUCTION OF BODY-SHELLS for Aronde cars was described in the preceding article of this series* concerned with the activities of the French SIMCA organization. Body assembly is undertaken in the main assembly shop of the new Poissy plant, where roof and under-body sub-assemblies, and certain other units, are welded together on trolley-jigs that circulate on a closed-loop line. Body sub-assemblies pass along a finishing line, that doubles back on itself, and, at stations along this line, doors, bonnets and boot lids are added, and certain welding and other operations are performed. From the end

of the finishing line, body-shells are passed to one of six storage slat-conveyors, and of these conveyors, two are used for storing 2-door shells to be finished in two colours, two for 4-door shells to be finished in two colours, and two for shells of either type to be finished in one colour. These storage conveyor conveyors feed a crosswise transporter at one end, whereby body shells are moved to a pick-up station below the drop-section of an overhead conveyor, on which they are transported to the paint shop.

As already mentioned in an earlier article, the paint shop is located on the first floor of the assembly building, on the side remote from the body sub-assembly sections. It serves not only for painting Aronde bodies, but also those for Vedette cars

which are produced in smaller numbers at the Poissy plant. There are two storage slat conveyors for Vedette body-shells, parallel with those for Aronde shells, and there is a separate pick-up position, below a drop section, for loading Vedette shells on to the conveyor leading to the paint shop.

It is a feature of the SIMCA sales policy, that a customer can have a very extensive choice of body colours and interior furnishing schemes, in addition to being able to select from various body styles, seat designs, engines, and accessories. It is stated that there is a total of 144 variants, and the number of single colours offered is 8, and of 2-tone colour combinations, 17. Special provisions have been made

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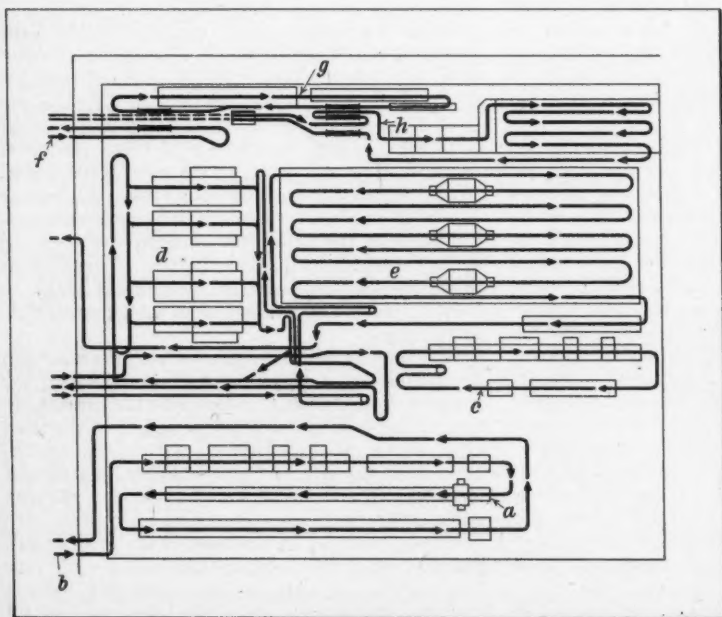


Fig. 1. Diagrammatic plan view of the section for finishing small components such as wheels, in the paint shop of the SIMCA factory at Poissy, France

at the Poissy factory to permit this wide choice, without disturbing the flow of work through the shops, and control is from a central station.

Essential details of the orders received for cars are transferred to punched cards, and include the type of car; the body colours; the type and colour of interior trim; the type of engine, rear axle, and certain electrical equipment; and the type and colour of the tyres. The appropriate instructions are transmitted to the various departments by teleprinters or telescribers, so that bodies of the required type are available on the storage conveyors feeding the paint shop. In a similar manner, instructions are transmitted to the trimming line to prepare interior furnishings of the required type and colour, as well as other components such as window assemblies, also to the final assembly line, to indicate the types of engines, rear axle assemblies, and other transmission units that are required.

PAINTING SMALLER COMPONENTS

In addition to the lines for bodies, a section in the paint shop provides for finishing smaller components, which will be considered first. The layout of this section is shown diagrammatically in Fig. 1, and it includes a flow-coating installation *a* for small parts that are required to be finished black. These parts are delivered by way of the conveyor *b* from the floor below, where they are mounted on hangers, and flow-coating is preceded by a Bonderizing treatment. Parts pass first through a washing installation and a drying oven, then through the flow-coating plant, and finally through a drying oven, before being returned to the ground floor by the conveyor.

Small components that are to be painted in colours are handled in the adjoining section, where there is a degreasing and passivating line *c*, a painting section *d*, with four conveyorized spray booths, and a group of conveyorized drying ovens *e*. Paint of different colours is delivered to the spray booths by fifteen pipe lines from a central supply. All components are carried on a single conveyor, and are diverted to the appropriate booth by cams on the carriers that support them.

The section for preparing and painting wheels has capacity for handling 300 units per hour, and is tended by only four operators. Wheels are delivered from the floor below by way of a storage

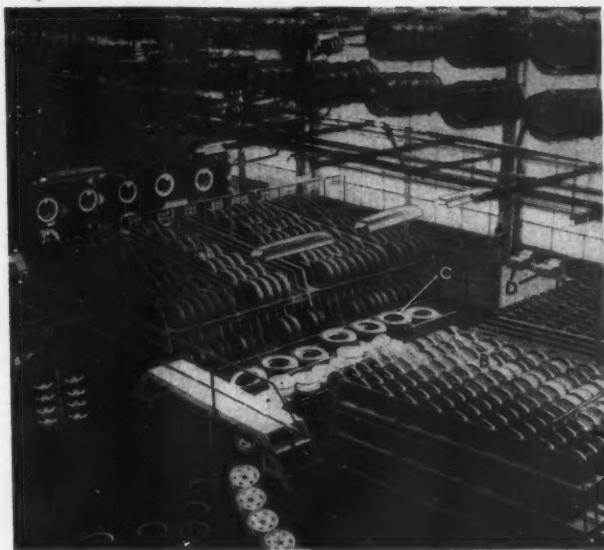


Fig. 2. Painted wheels and tyres are stored in gravity-feed racks on either side of twin roller conveyors whereby matched sets are delivered to an automatic tyre fitting installation

conveyor *f*, whereon circulate 150 hangers, each holding 15 wheels in three rows, as may be seen in the upper part of Fig. 2. One operator unloads wheels from this conveyor, and transfers them to the conveyor of a Tunzini-built line *g* for Bonderizing treatment, the hangers of which carry three wheels each. This line, it may be mentioned, is equipped with an automatic metering unit for the supply of additives to replenish the Bonderizing bath.

From this phosphating line, a second operator transfers the treated wheels to the hangers of a conveyor *h*, which transports them through the painting section. Each hanger carries a single wheel, supported on a 3-arm spider. The spider arms are stepped to accommodate wheels of two sizes, and the hanger is arranged to rotate. Instructions are delivered to the spraying operators by teleprinter, and specify the time of day, number of wheels, and their colour, size and destination.

WHEEL AND TYRE STORAGE

From the painting section, the wheels are fed to the stock area seen in Fig. 2, adjoining a loading bay to which untreated wheels and tyres are delivered. At this loading bay, the wheels are

also storage on live or dead lines. Conveyors of generally similar design are used extensively in the Poissy plant.

The layout of the body-painting lines is shown diagrammatically in Fig. 3, and the conveyor *j* transports the body-shells from the storage conveyors of the assembly shop. Body shells pass first through the section *k*, where initial washing and rubbing down are carried out. It will be observed that there are two conveyor lines passing through this section, and the carriers from which the body-shells are suspended, are diverted to one conveyor or the other by "points", that are set automatically to give the required flow along each line. The points are operated electromagnetically, and are controlled by limit switches at a position in advance of the junction, along the conveyor track. These switches are actuated by trip-pins that slide horizontally in the load bar, which connects the carrier to the trolley that runs on the track, and the trip-pins are pre-set in accordance with instructions transmitted by teleprinter, before the body-shells enter the painting department.

At the head of each conveyor line, the carriers are held back by a special King unit, known as an indexer, which is indicated at *l*. Further indexers in the section *k* release the carriers as space becomes available in the parallel Bonderizing installations *m*. Each indexer comprises a section of conveyor with provision for lifting the driving chain so that the dogs are clear of the trolleys on the conveyor track. Electrically or mechanically operated units are available, and the former type is employed in the Poissy paint shop. The freed trolley is retained by a stop dog on the "downstream" side, which is connected to the indexer mechanism, and by a counterweighted and pivoted dog, over which the trolley passes as it enters the indexer. It is usual to arrange indexers so that they are equally spaced along a length of conveyor, as in the section *k*. The trolley of a loaded carrier passes to successive indexers, and if the following section of the line is fully occupied, it is arrested by the foremost indexer downstream. Following carrier trolleys are stopped by the upstream indexers, and as the carrier trolley on the foremost indexer is released, the following carrier trolleys are freed in turn and each is advanced to the next indexer in the group. It will be appreciated that if space is available on the line beyond the indexers, the carriers can pass through the units without restraint.

At the end of each Bonderizing plant *m* there is a draining area in advance of a drying tunnel, as at *n*, which is heated to 180 deg. C. From this oven, each conveyor passes through a cooling

unit, after which the two conveyors join to form a single line. Flow of body-shells from the twin conveyors to the single line is controlled by groups of three indexers, and movement of the carriers on to the single track is effected by an automatic unit. The driving chains of the two parallel conveyors from the Bonderizing section are directed clear of the associated trolley tracks by guide wheels, and the return run of each chain passes along the outside of the enclosure for the section, to the head of the line. Radially-projecting arms are incorporated in the unit which engage the carrier trolleys and transfer them to the single track. Transfer is complicated by the differing flow rates of the two preceding conveyors. Carriers are accumulated by the indexers, the number of carriers at the end of each line is detected, and the transfer unit feeds carriers from the fuller line to the single track.

BLACK LACQUER SPRAY TO FACILITATE FAULT DETECTION

On the single conveyor, the carrier trolleys are again engaged by dogs on a driving chain, whereby they are moved through the spray booth indicated at *p*, and a thin coat of a special black synthetic lacquer is applied to the body shell. Known as "black mist", this lacquer dries in three minutes and facilitates the detection of any faults in the body pressings at a subsequent inspection and rectification stage. The spray booth is of draught type, air being delivered by way of grids in the roof, and extracted through the steel-slat floor, beneath which there is a water bath. There are 13 complete changes of air per minute.

Following the application of the "black mist", the bodies pass through the inspection and rectification section *r*, Fig. 3, and the end of this section is shown in Fig. 4. Along each side of the section there are banks of fluorescent tubular lamps, one bank with the lamps arranged vertically, and the other with the lamps at an angle as at *E*. The very high level of illumination, in conjunction with the black lacquer coating, allows any imperfections in the body form to be readily detected, and made good. Operators on either side of the conveyor, at the end of the section, apply special sealing compound to the joint between the wings and the mating components of the under-body. This special plastics compound is pressure fed by way of flexible hose, and is applied by manually operated nozzles as at *F*.

At the end of the section *r*, Fig. 3, the conveyor turns through 90 deg., and then branches into two lines, as indicated at *s*, for transport of the bodies back down the length of the shop. In



Fig. 4. At the end of the section for making good faults in the body shells, special plastics sealing compound is applied to certain joints in the bodies with the aid of manually-directed nozzles

advance of the branching position, there is provision for diverting body shells on to a storage conveyor *t*. This conveyor, and others that will be mentioned later, are provided for the accommodation of body shells in the event of a breakdown, also to permit the continued movement of the shells through such units as drying ovens, after the remainder of the plant has been stopped for meal breaks and at the end of the second shift of the 2-shift working day. The storage conveyor rejoins the main conveyor line in advance of the paint booth *p*, and flow of body shells from the storage conveyor is controlled by indexers, as indicated.

APPLYING UNDERSEAL TO BODY SHELLS

Identical operations are performed on the two lines *s*, so that only one line need be described. The speed of the two lines may be varied, however, up to a maximum ratio of 3:1, and the flow of body shells is again

controlled by indexers. Underseal is provided on all SIMCA bodies, and consists of a black bituminous coating which is applied by dipping. Bodyshells pass first through a section *u* at the entry end of a long booth, where they are wiped over with tack-rags, to remove dust, since the following sections of the line provide not only for applying underseal, but also the primer coat.

From the wipe-off station, the bodyshells pass to the dipping station *v*, and Fig. 5 shows a body-shell entering the dipping bath. To ensure that all the internal areas of the underbody are coated with underseal, there is a series of jets at the entry end of the bath, as seen at *G*. Bituminous compound is pumped from the bath, through these jets, by way of a control valve *H* at one side of the station, this valve being opened and shut by an operator. Compound is projected by the jets into the interior of the wings, for example, and once the body has entered the bath, the compound also flows through the side



Fig. 5. A body shell entering the dip tank for the application of undersealing compound. Jets of compound are directed by nozzles into the interiors of the wings and other "difficult" areas

members of the under-body, and through holes in the floor pressings on to the upper floor surfaces.

It is required to keep the interior of the luggage boot free from underseal and the opening in the spare-wheel well is sealed by a rubber faced mask, as indicated at *J* in Fig. 6. The mask is secured by a lever-actuated clamp, and is fitted at the wipe-off station. Operators at either side of the line, using jets of solvent, clean off the external surfaces of the body shell as it leaves the bath, in order to avoid the formation of lines and patches on those bodies that are finished in light colours. The contaminated solvent drains back into the bath, which is connected to a recirculating system that incorporates automatic controls for maintaining the solvent content of the bituminous compound at a constant value.

After passing over drain-off grids, the body-shells enter a booth *w*, Fig. 3, for the application of primer coat. At the entry end of this booth, "difficult" areas of the body-shell are spray-painted by hand, and the shells then pass through two Schweitzer automatic installations for application of the grey primer coating. As the body-shells pass out of the primer painting booth, they are diverted to either of two parallel conveyors *x* which serve the drying oven *y*.

Body-shells are directed on to either of these conveyors alternately by a unit known as a "matched dog switch wheel corner," which is similar to that described earlier in that it has radial transfer arms that move the carriers on to one track or the other, after the normal driving chain of the feeding conveyor has been diverted. As each carrier enters one conveyor, a trip dog on the carrier frame actuates a limit switch to operate a "point" in the carrier track, so that the next unit is directed on to the other conveyor line. Special provisions had to be made to ensure that the speed of the two parallel conveyors is half that of the single conveyor feeding them.

The drying ovens *y* are maintained at a temperature between 160 and 180 deg. C., by automatic control gear installed at one side, and at the end of each oven, the body-shells pass through a cooling unit *z*. All four conveyors (two from each oven) are brought together beyond the cooling units and feed a single conveyor *aa*. Flow of the body-shells along each conveyor of the four, and

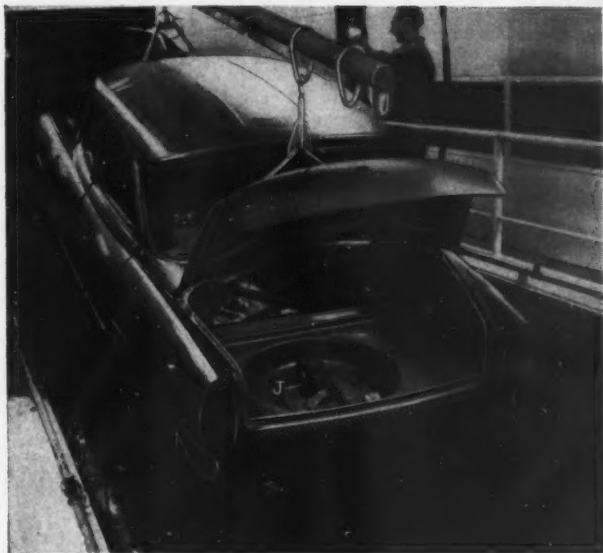


Fig. 6. An opening in the spare wheel recess is sealed with a rubber pad that is held in place by mechanical clamps, to prevent entry of undersealing compound into the luggage boot

along the single conveyor beyond the junction, is controlled by indexers. Body shells travel through a station *bb*, and pass over floor grids where plastics sealing compound is applied to the joints inside the engine compartment, body and luggage boot, by use of hand-manipulated nozzles, similar to those in Fig. 4. Compound of a heavier consistency is applied by nozzle to line the sealing channel for the hinge-end of the bonnet to ensure water tightness.

Sheets of bituminous sound-insulating material are placed on the floor of the passenger compartment, also in the luggage boot, at station *cc*. This material is softened and adheres to the body when the latter passes through the paint drying ovens later in the finishing sequence. After they have been cleaned down at station *dd*, the bodies pass through a series of rubbing-down stations in the section *ee*, and these operations are followed by washing off by means of a water spray, excess water next being blown off with compressed-air delivered through manually-operated nozzles. Bodies then pass through an oven *ff* maintained at a temperature of 180 deg. C., wherein they are thoroughly dried, and thence through a cooling unit.

An inspection station follows, and the bodies



Fig. 7. At the end of the primer coating section, a frame with pierced metal labels is hung in the windscreen opening to indicate to the operators at subsequent sections of the painting lines which colours are required for different areas of the body shell

are touched-up, as necessary, at the next station. At the end of this conveyor line, a frame is hung in the windscreen opening of each body, as seen in Fig. 7. This frame supports metal labels with pierced numbers, and for 2-tone bodies, there are two labels, to indicate the colours for the upper and lower portions of the shell. Instructions relating to the colour scheme are transmitted to the line by means of a teleprinter unit, from the central control. In addition, at the end of the line, 2-tone body-shells are masked. Kraft paper from rolls at one side of the line is used for this purpose, and is secured with adhesive tape.

FINISHING LINES

The conveyor carrying the body-shells curves through 90 deg., and on reaching a point *gg*, the shells that only require a single colour finish are diverted to the conveyor *hh*, Fig. 3, whereas those requiring 2-tone (and in certain instances 3-tone) finishes pass on to a conveyor which feeds

two branches *jj* and *kk*. Carriers on the conveyor *hh* are again divided into two streams that pass on to the conveyors *ll* and *mm*. All four conveyors—*jj*, *kk*, *ll* and *mm*—pass through spray painting and drying lines, and operations on the line served by the conveyor *jj* only will be described. This line provides for painting the upper portions of 2-tone bodies, or for those areas that are painted a third colour on 3-tone bodies.

At the start of the line, in the section indicated at *nn*, the interior of each body shell is carefully cleaned by an operator who uses a vacuum nozzle, connected to a central extraction unit. This operation is seen in progress in Fig. 8, the illustration showing the corresponding section at the start of the line served by the conveyor *ll*. Each shell is then wiped down with tack-rags at the



Fig. 8. Before the finishing coats are applied, the interior areas of the body shells are thoroughly cleaned with the aid of a nozzle connected to a central vacuum installation

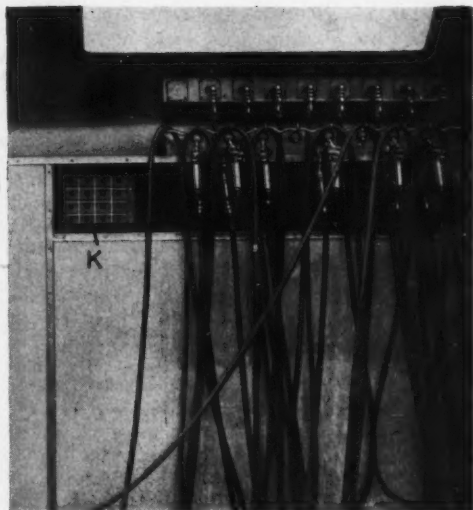


Fig. 9. Part of a rack of spray guns in one of the finishing booths. Each gun is supplied with paint from a central preparation room, and the colour of the paint is indicated by a number label, the numbers corresponding with those in the windscreen openings of the body shells

station *pp*, before it enters the spray painting booth *rr*. Inside the booth there are four operators, each of whom has access to 14 spray guns in a rack at one side. The end of one such rack is seen in Fig. 9, and each gun is fed with synthetic lacquer from a centralized supply, a metal label bearing a code number being mounted above it. At one end of the rack there is an indicator lamp panel *K*, but at the time of our visit, this panel was not ready for operation, and guns were selected in accordance with the metal labels mounted on the frame in the windscreen opening of each car. When completed, the indicator panel *K* will be connected to the central control, and a number will be illuminated to indicate to the spraying operator which gun to use. The labels in the windscreen openings will then be used solely as a check.

The paint booth, like all others in the department, was supplied by the

French firm of Tunzini, and incoming clean air is supplied through grids in the roof, and is extracted through the steel-slat floor. Contaminated air passes over a water bath, and is then circulated through a cleaning system, before being returned to the booth. The remainder of the line is similar to that for applying primer, and the carriers are diverted to either of two conveyors that pass through drying ovens, maintained at 140 deg. C. From these ovens, the body-shells pass through cooling units, and then the four conveyors—two from this line, and two from the parallel line—converge to feed a single conveyor. Fig. 10 is a view looking towards the ends of the twin ovens of each line, and the paths of the tracks and the driving chains of the overhead conveyors can be clearly seen. Movement of the carriers from each track is effected by a King wheel transfer unit, and the flow of carriers towards each unit is controlled by indexers, as indicated in Fig. 3.

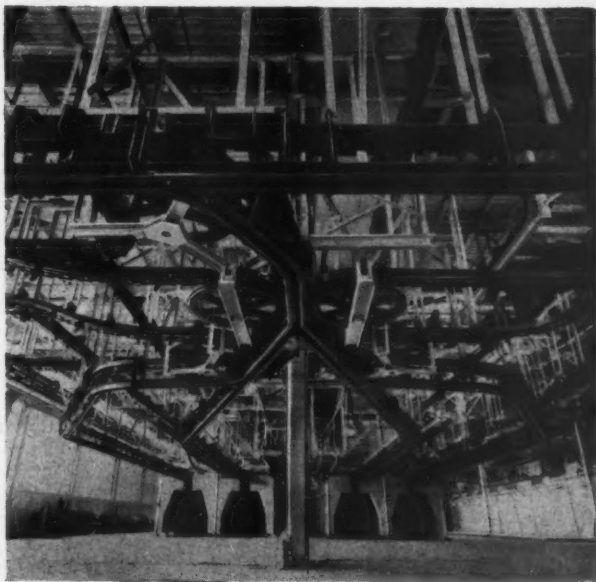


Fig. 10. View of the complex junction at the end of one of the finishing lines, where four King Dual-Duty conveyors from the drying ovens join to form a single track, to which a night-storage conveyor is also connected



Fig. 11. The final inspection section at the end of the last of the painting lines. Flow of the body-shells from the four parallel ovens is controlled by King indexers. A finished body-shell for an Aronde car is seen in the foreground, with a Vedette body-shell behind

On the conveyor *ss*, Fig. 3, the carriers are transported to a rubbing-down section *tt*, where overspray on those areas that are to be painted in a contrasting colour is removed. The distance from the end of the drying ovens to the start of this section provides for final hardening, also for inspection. If required—during meal breaks and at night, for example—body-shells can be diverted to a storage conveyor, which circulates, as indicated, round the painting line just described, and rejoins the conveyor *ss*. From the rubbing-down section *tt*, body shells pass through a drying oven maintained at a temperature of 180 deg. C., then through a cooling unit to a section of conveyor *uu* where the areas that have been painted are masked with Kraft paper. Body-shells that are to have a 3-tone finish are diverted along the conveyor *vv*, which curves round and joins the conveyor *kk*, flow of the carriers being controlled by indexers. These bodies then pass through the same sequence of operations that has been described in connection with the line served by the conveyor *jj*, for application of the second colour of the 3-tone scheme, and rejoin the conveyor *ss*, to pass again through the

rubbing down, drying, cooling and masking stages as already described.

Two-tone bodies that have received their first colour, and 3-tone bodies that have received their first and second colours, are automatically fed by indexers to a wheel transfer unit that directs them to a conveyor extending beyond the conveyor *hh*, and from this conveyor they are diverted to either of the conveyors *ll* or *mm*. The line served by each of these conveyors provides for a sequence of cleaning, painting and drying operations similar to that described. Since a greater area of body has to be painted, the spray booth of each final painting line is longer than those on the preceding lines, but otherwise the equipment of all lines is similar.

Carriers with completely painted body-shells on the four conveyors from the drying ovens of the final painting lines pass through indexers and at these positions the body-shells are carefully inspected. An inspection station is seen in Fig. 11, with a 2-tone Aronde body in the foreground, and a 3-tone Vedette body behind it. Carriers are fed by wheel transfer units to the conveyor *ww*, Fig. 3, which curves through 180 deg. to a straight run that is at 90 deg. to the painting lines. Paintwork on the body shells is retouched, as required by the inspection department, at stations *xx*, and skids are fitted to the side-members of the underbody at stations *yy*, in readiness for mounting on the trimming lines. Body shells can be switched from the conveyor *ww*, to the storage conveyor *zz*, which circulates round the finish painting lines and rejoins the conveyor *ww*.

With the skids fitted, the body shells are transported by overhead conveyor to the end of the department, and pass through an opening in the floor to the head of the trimming lines in the assembly shop below.

It may be mentioned here that all drying ovens in the painting department were supplied by the Carrier Engineering Co., Ltd., or their French associates, and all paint booths, by the French Tunzini company. The conveyor system supplied by Geo. W. King, Ltd., has a total length of approximately 330,000 ft. Carriers used for transporting the body-shells are of a universal design which will accommodate shells for all variants of the Aronde and Vedette cars. Each carrier is checked for mechanical condition at monthly intervals.

The completely automatic operation of the conveyors, in conjunction with the associated units such as indexers, wheel corners, drop sections and transfer units, is controlled by electrical switchgear supplied by the Donovan Electrical Co., Ltd., Birmingham. Speed regulation of the driving chains of the whole conveyor system is obtained

by means of Heenan & Froude variable speed couplings. The conveyors of the system fall logically into six groups, each group being controlled from a separate multi-panel Donovan enclosed switchgear installation in the central control room *ba*, Fig. 3. Individual local control panels are provided for the drop sections.

Over-riding control of the painting plant is afforded by a master console in the central control room, and this console is seen in Fig. 12. The controller can start or stop the plant at will, and can initiate the desired method of operation. Push-button switches for individual or group starting of the various units of the conveyor system are conveniently located to his right and left, with selector switches for "run" and "inch" control, also for diversion of the carriers to the night storage conveyors. Speed control setting knobs are also located on the panel. Facing the controller is a mimic diagram with signal lamps to indicate the state of all conveyors and transfer units, and at either end of the console there are banks of lamps that indicate abnormal occurrences of various types. The controller can communicate with the painting lines by means of a loud-

speaker system, and with maintenance and other departments by telephone.

PAINT PREPARATION

Synthetic paint employed by SIMCA for car bodies is prepared on the floor above the paint shop. Roller conveyors are installed to facilitate handling the drums in which the paint is supplied by the manufacturer, who is responsible for maintenance of the required standards of quality and colour, all paint being checked at the Poissy plant before it is used. From each drum, paint is transferred to a filter unit by motor-driven pump, which also agitates the paint so that it is thoroughly mixed. Thinners are added by means of a metering pump, through a nozzle, with integral cut-off valve, similar to that provided on a garage petrol pump.

Paint is delivered by pipeline to a room on the same floor as the painting lines, this room being indicated at *bc* in Fig. 3. Here, there is a series of tanks, each of 300 litres (approximately 80 gal.) capacity, two tanks being provided for each colour, so that one can be replenished while paint from the other is being used. Each tank is equipped with a motor-driven stirrer and a sampling cock. One operator supervises the installation in this room, and coats test strips which are subjected to water, saline and age tests. From the tanks, the paint is delivered by pipelines to the various spray booths. A laboratory for testing and control of the paint is located in an adjacent room, indicated at *bd*.

Operations performed on Aronde bodies after they have been painted, also work carried out in the sections associated with the trimming and final assembly lines, will be considered in the concluding article of this series, to be published shortly in MACHINERY.



Fig. 12. All the conveyors and auxiliary units in the paint shop can be controlled from this central console. Signal lamps indicate the conditions in all sections of the shop, and in the event of a breakdown the controller can communicate with operators, maintenance men and other workers by loud-speaker and telephone

HOLLOW BORED BARS FOR HYDRAULIC CYLINDERS. Keeton, Sons & Co., Ltd., Greenland Road, Sheffield, 9, can now supply hollow bored bars of increased internal diameter and lengths, for example, for hydraulic cylinders. Bars with bores machined to limits of ± 0.003 in. are available with diameters from $\frac{1}{2}$ to 12 in. and bars with honed bores to limits of ± 0.001 in., from 2 to 12 in. The maximum length of bar now available is 18 ft.

Outside diameters are rough turned to ensure straightness and concentricity. Standard materials include commercial quality mild steel and 0.35-0.45 carbon steel, but bored bars can also be supplied in alloy steel and non-ferrous alloys.

Number Codes

By O. S. PUCKLE, M.I.E.E.

THE METHOD OF COUNTING which is commonly used today, although its origin has largely been forgotten, is, in fact, a code. For example, what is meant by the number 8295? It means $(8 \times 10^3) + (2 \times 10^2) + (9 \times 10^1) + (5 \times 10^0)$. It may either be referred to as the number eight thousand, two hundred and ninety-five, or in *decimal digits* as eight, two, nine, five. It will be noted that, in the decimal code, a count is made from 0 to 9, and then 1 is carried (*i.e.*, 1 is put in front), followed by a further count from 0 to 9, and a further carry (*i.e.*, the previously carried 1 is changed to a 2), and so on.

Today, the binary code, which, as its name implies, uses the base 2, is also coming into use. In all digital number codes, the highest possible value of a digit is one less than the number of the base. Thus, when the base 10 is used, the highest digit is 9. In the binary code (base 2), the highest digit is 1 and there are only two digits, namely, 0 and 1. With the binary code, the count is from 0 to 1 and then 1 is carried, followed by a further count from 0 to 1. The next carry must, however, be to one further column to the left, since no digit can exceed 1 in value. Imagine that there is a row of men, and that the man on the right of the row is receiving items to be counted. If this man makes a bundle of each two items he receives and passes it to the man on the left, the action represents a carry. When the second man has received two carries (two bundles of 2), he ties them together and carries them to the third man and so on. The first binary carry, therefore, represents a 2 in decimal notation, the second represents a 4, and the third an 8, the fourth a 16, and so on. Thus, if each of the first four men holds a bundle they will represent the binary number 1111, which may be expressed as:

$$2^3 + 2^2 + 2^1 + 2^0$$

which, in decimal notation, represents:

$$8 + 4 + 2 + 1 = 15.$$

Since four binary digits (known, for short, as "bits") are required to represent the decimal number 15 (compared with two digits for decimal notation), five digits to represent 16, six to represent 32, and seven to represent 64, it may sometimes be more convenient to use the *decimal* form of the binary code. Each decimal digit is then converted

separately into the binary code, instead of converting the whole decimal number. In this case, the decimal number eight, two, nine, five is written as 1000, 0010, 1001, 0101, as will be clear on reference to the accompanying table.

THE USE OF BINARY CODE FOR THE TRANSMISSION OF INFORMATION

The fact that there are only two digit values (0 and 1) in the binary system is of great importance in transmitting information through a medium which may be subject to noise or interference. With this system, there is no need to determine the actual instantaneous amplitude at the receiving end, as would be essential if each digit had ten possible amplitudes instead of only two, but only to ascertain whether a current is flowing or not.

TABLE SHOWING REPRESENTATIVE DECIMAL NUMBERS WITH DIRECT BINARY EQUIVALENTS AND ALTERNATIVE DECIMAL/BINARY EQUIVALENTS

Decimal number	Binary equivalent										Decimal binary equivalent
	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰	
0	0	0	0	0	0	0	0	0	0	0	0
1											1
2									1	0	10
3									1	1	11
4									1	0	100
5									1	0	101
6									1	1	110
7									1	1	111
8						1	0	0	0	0	1000
9						1	0	0	1	1	1001
10						1	0	1	0	0	1, 0
11						1	0	1	1	1	1, 1
12						1	1	0	0	0	1, 10
13						1	1	0	1	1	1, 101
14						1	1	1	0	0	1, 110
15						1	1	1	1	1	1, 1001
16						1	0	0	0	0	10, 0
17						1	0	0	0	1	10, 1
18						1	0	1	0	0	10, 10
19						1	0	1	1	1	10, 101
20						1	1	0	0	0	11, 0
21						1	1	0	0	1	11, 1
22						1	1	1	0	0	11, 10
23						1	1	1	1	1	101, 0
24						1	1	1	0	0	110, 100
25						1	1	1	0	1	111, 1000
26						1	1	1	1	0	111, 1000
27						1	1	1	1	1	1, 1, 1000
28						1	0	0	0	0	10, 110, 1
29						1	0	0	0	1	
30						1	0	1	0	0	
31						1	0	1	1	0	
32						1	1	0	0	0	
33						1	1	0	0	1	
34						1	1	1	0	0	
35						1	1	1	0	1	
36						1	1	1	1	0	
37						1	1	1	1	1	
38						1	0	0	0	0	
39						1	0	0	0	1	
40						1	0	1	0	0	
41						1	0	1	0	1	
42						1	0	1	1	0	
43						1	0	1	1	1	
44						1	1	0	0	0	
45						1	1	0	0	1	
46						1	1	1	0	0	
47						1	1	1	0	1	
48						1	1	1	1	0	
49						1	1	1	1	1	
50						1	0	0	0	0	
51						1	0	0	0	1	
52						1	0	1	0	0	
53						1	0	1	0	1	
54						1	0	1	1	0	
55						1	0	1	1	1	
56						1	1	0	0	0	
57						1	1	0	0	1	
58						1	1	1	0	0	
59						1	1	1	0	1	
60						1	1	1	1	0	
61						1	1	1	1	1	
62						1	0	0	0	0	
63						1	0	0	0	1	
64						1	0	1	0	0	
65						1	0	1	0	1	
66						1	0	1	1	0	
67						1	0	1	1	1	
68						1	1	0	0	0	
69						1	1	0	0	1	
70						1	1	1	0	0	
71						1	1	1	0	1	
72						1	1	1	1	0	
73						1	1	1	1	1	
74						1	0	0	0	0	
75						1	0	0	0	1	
76						1	0	1	0	0	
77						1	0	1	0	1	
78						1	0	1	1	0	
79						1	0	1	1	1	
80						1	1	0	0	0	
81						1	1	0	0	1	
82						1	1	1	0	0	
83						1	1	1	0	1	
84						1	1	1	1	0	
85						1	1	1	1	1	
86						1	0	0	0	0	
87						1	0	0	0	1	
88						1	0	1	0	0	
89						1	0	1	0	1	
90						1	0	1	1	0	
91						1	0	1	1	1	
92						1	1	0	0	0	
93						1	1	0	0	1	
94						1	1	1	0	0	
95						1	1	1	0	1	
96						1	1	1	1	0	
97						1	1	1	1	1	
98						1	0	0	0	0	
99						1	0	0	0	1	
100						1	0	1	0	0	
101						1	0	1	0	1	
102						1	0	1	1	0	
103						1	0	1	1	1	
104						1	1	0	0	0	
105						1	1	0	0	1	
106						1	1	1	0	0	
107						1	1	1	0	1	
108						1	1	1	1	0	
109						1	1	1	1	1	
110						1	0	0	0	0	
111						1	0	0	0	1	
112						1	0	1	0	0	
113						1	0	1	0	1	
114						1	0	1	1	0	
115						1	0	1	1	1	
116						1	1	0	0	0	
117						1	1	0	0	1	
118						1	1	1	0	0	
119						1	1	1	0	1	
120						1	1	1	1	0	
121						1	1	1	1	1	
122						1	0	0	0	0	
123						1	0	0	0	1	
124						1	0	1	0	0	
125						1	0	1	0	1	
126						1	0	1	1	0	
127						1	0	1	1	1	
128						1	1	0	0	0	
129						1	1	0	0	1	
130						1	1	1	0	0	
131						1	1	1	0	1	
132						1	1	1	1	0	
133						1	1	1	1	1	
134						1	0	0	0	0	
135						1	0	0	0	1	
136						1	0	1	0	0	
137						1	0	1	0	1	
138						1	0	1	1	0	
139						1	0	1	1	1	
140						1	1	0	0	0	
141						1	1	0	0	1	
142						1	1	1	0	0	
143						1	1	1	0	1	
144						1	1	1	1	0	
145						1	1	1	1	1	
146						1	0	0	0	0	
147						1	0	0	0	1	
148						1	0	1	0	0	
149						1	0	1	0	1	
150						1	0	1	1	0	
151						1	0	1	1	1	
152						1	1	0	0	0	
153						1	1	0	0	1	
154						1	1	1	0	0	
155						1	1	1	0	1	

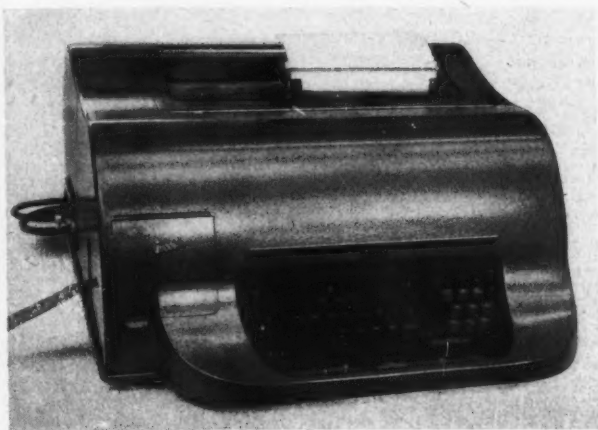


Fig. 1. Creed tele-typewriter on which tapes for use with the E.M.I. machine tool control system can be produced

Communication can be carried out by causing the presence of current at the receiver to operate one or more switches. The transmitted message may then be automatically read by a device which examines the switches to detect which have been operated. Since the switches can be arranged to ignore interference, the transmitted information cannot be distorted or destroyed.

Lengths of paper tape may be punched with holes to represent "ones" in the decimal binary code ("noughts" being represented by the absence, of holes), with, or without, the use of alphanumerical codes. An alphanumerical code is one in which letters and mathematical—or other—signs are represented by numbers which are not otherwise likely to be needed. These numbers are, of course, used in their binary form.

The tapes are prepared on a form of tele-typewriter, such as is shown in Fig. 1, which automatically punches the correct code as each key is depressed. After punching, the tape is automatically moved on to the next position. With certain of these machines, a typed copy of the punched information is also provided, to enable the accuracy of the work to be checked, and for record purposes. Sometimes, machines have two terminals, so that one may be used at each end of a line or radio circuit for punching a tape and/or recording a message at a distance. Alternatively, a tape punched on a machine without these terminals may be fed into a tape reader which provides an output in the form of electrical signals corresponding to the punched information, for use locally, or at the far end of a telegraph circuit.

INFORMATION AS A MEANS OF CONTROL

No system can be controlled without imparting information to it, and this information may be "built in" when the system is constructed, or it may be supplied later, or both. Information fed into a system after it has been constructed is sometimes required to be continuous. In other circumstances it may be intermittent, as in a telegraph or telephone system. When a system has built-in information, it may be practically inhibited from responding to external information. With other systems, built-in information may be supplemented—and sometimes supplanted—by external information, as takes place in a digital computer.

Machine tools, processing equipment, transport systems, and computers necessarily have built-in functions but they are also susceptible to control as a result of the transmission to them of external information by manual or other means. Normally, a machine tool which could only be used to cut parts of one particular shape and size, or a vehicle which could travel only on a particular route, would have limited application. Sometimes, of course, the built-in information is of such a restrictive nature that—except as a result of an accident—it cannot be over-ridden. For example, one important feature of a railway system is that the train routes are limited to the layout of the track, although the provision of switching-points permits supplementary information to be imparted for route selection.

THE APPLICATION OF PUNCHED-TAPE TO MACHINE TOOL CONTROL

When a machine tool is manually controlled, the operator imparts to it information concerning the dimensions of the part which he wishes to machine. By selecting the appropriate cutter and by moving the slides, the desired result is produced. In addition to dimensional information, the operator must impart management information. Such information is provided, for example, by switching the power on and off, and adjusting feeds and speeds. All such information can be fed to a machine by recording it in punched form on a paper tape, using the decimal binary code, with alphanumerical codes for management instructions.

Standard 5-hole teleprinter tape ($\frac{1}{8}$ in. wide) is very suitable for the purpose because it is easily obtainable, as are the punching machines and tape

readers. Examination of the table will show that five holes, across the width of the tape (binary 11111) represents the decimal number 31, and that no holes represents nought. Therefore, 5-hole tape can accommodate 32 separate signals, of which the first ten may be used for dimensional information and the remainder for machine management. If this arrangement is adopted, the tape code will be as shown in Fig. 2, where the larger spots represent signal holes and the smaller spots are sprocket holes for drawing the tape through the reader.

The signals issuing from the tape reader are applied in different ways for different machine tool control systems, and the codes representing 0-9 are not always used for the provision of dimensional information.

It has been found that errors can occur when a switch fails to work because the tape reader occasionally fails to detect a hole. Although such a failure may happen less than once in a million times, it can sometimes cause rejection of work for inaccuracy, and may even result in damage. Errors of this type, however, can be enormously reduced

Decimal Number	Punched Paper Tape Binary Code	Typed Symbol
0		0
1		1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		S
11		T
12		U
13		V
14		
15		
16		†
17		B
18		C
19		D
20		E
21		F
22		G
23		H
24		J
25		K
26		L
27		M
28		N
29		A
30		R
31		*

Fig. 2. Typical portion of punched tape showing an arrangement of 32 separate punched-hole signals of which the first ten are reserved for dimensional information and the remainder are for machine management information

Decimal Number	Code Value Used	Punched Paper Tape Binary Code	Typed Symbol
0	16		0
1	1		1
2	2		2
3	19		3
4	4		4
5	21		5
6	22		6
7	7		7
8	8		8
9	25		9
10	10		Man
11	11		Dim
12	12		
13	3		
14	5		
15	15		
16	6		
17	17		
18	18		
19	9		
20	20		
21	23		
22	24		
23	27		
24	29		
25	30		

Fig. 3. This portion of punched tape shows a code system in which "odd" codes are used for dimensional information and "even" codes for management information

by using the principle of differentiation between the dimensional and management information. The use of the principle of redundant information is another valuable method of avoiding errors.

THE USE OF REDUNDANCY IN CODES

Redundant information is, as the term implies, information which is present in a message in addition to that which forms part of the message. It is obviously necessary to ensure that the redundant information cannot confuse the message information. In using the principle, all that is necessary is to provide a redundant signal for separating the dimensional and management instructions. This result may be achieved in several ways.

For example, a block of dimensional information may be preceded by a signal which indicates its starting position on the tape, and another signal may be used to introduce each management instruction or block of instructions.

DIFFERENTIATION BETWEEN TYPES OF SIGNAL

If, in addition, every block of dimensional information consists of signals produced only by an ODD number of holes in each row across the

tape, and each management instruction is produced only by an *EVEN* number of holes, the risk of damage due to a failure of the tape reader to detect the correct number of holes can be reduced almost to vanishing point. It is also possible to arrange that such a failure will cause the cutter to be withdrawn from the work and the machine tool stopped. Moreover, since the machine tool takes time to respond to information, it can be shut down before it has time to act upon that information.

Examination of the section which represents a length of punched tape in Fig. 2 shows that there are sixteen *ODD* and fifteen *EVEN* codes (or arrangements of punched holes) available, together with "no holes," the code for nought.

Fig. 3 illustrates an arrangement in which even and odd codes are used. With this system, the decimal number 3, which is in the section devoted to dimensional information, is represented by the code value 19. As can be seen in Fig. 3, this number requires three punched holes (that is, an odd number of holes) whereas if the actual decimal binary equivalent of the number 3 were to be used, two punched holes would be needed (that is, an even number). Similarly, the code value 21 (again three punched holes) is used to represent the decimal number 5, since the direct decimal binary equivalent of that number requires an even number of punched holes, see Fig. 2.

The same procedure is adopted in the section of tape which is devoted to management information. Here, only even-numbered groups of holes are employed. For example, the decimal number 13 is represented by the code value 3, since, otherwise, three punched holes are required (see Fig. 2).

It will be seen that, in Fig. 3, only 11 of the 16 available odd codes are employed, so that 5 odd codes are left unused. By using even codes for dimensional information, and odd codes for management information, one more code can be made available, if necessary.

In at least one control system, the tape is read intermittently in blocks containing dimensional data for two successive co-ordinate points. Normally, the information relating to each co-ordinate data point is specified in terms of a 5-digit number for each axis so that, for a 2-dimensional control system, twenty digits form one block of dimensional data. A 3-dimensional system requires thirty digits. There is, however, a variation known as $2\frac{1}{2}$ D, in which, in one of the axes that can be selected at will, the positional adjustment is made intermittently instead of continuously. A management signal informs the system when the third axis data are to be read and when they are to be acted upon. This variant is considerably less expensive than the corresponding 3-

dimensional system, and yet it will provide for almost any type of work, including die-sinking. With any of these variations, the control system counts the number of digits read by the tape reader, and stops it when the required number is reached. Any intermediate management instructions are ignored so far as counting is concerned, and the code may be the same as in Fig. 2. Alternatively, if redundancy is to be employed, the following arrangement may be used.

The required number of dimensional data digits is read and is counted as the tape reader detects them. If no management instruction is needed at the end of the block of information, the next block of dimensional data follows. If, however, one or more management codes are required, they will have been inserted after the dimensional data and will be followed by an "End of Block" code, which ensures that the counting of the next block of dimensional data digits starts at the right place. No gaps are left between the digits of one axis and those of the other, nor between the digits relating to the first and the second co-ordinate points. Moreover, there must not be a gap between blocks of data, since it would cause an error in counting the digits and in the numerical value of the data. At the beginning of the tape, an "End of Block" code must be provided to cause digit counting to start. A suitable code is shown in Fig. 4.

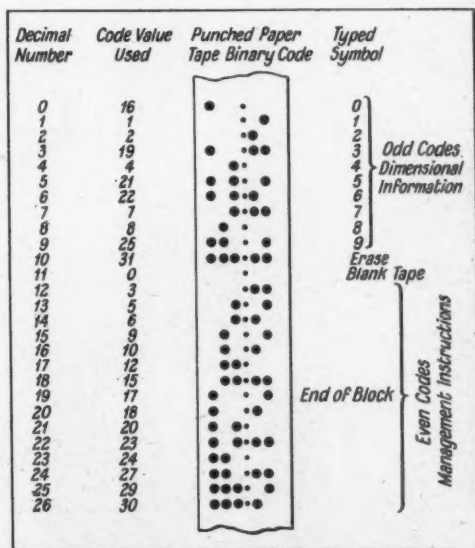


Fig. 4. An alternative code system for punched-paper tape

The "Blank Tape" code (seen at 11) is needed for providing blank portions of tape, except for sprocket holes, at the beginning and end of the tape. With the code shown in Fig. 2, the binary code 0 is used for this purpose.

OTHER USES OF PUNCHED TAPE

Punched tape may be used for controlling a variety of manufacturing processes and transport systems, and for the integration of the transport and processing systems within a factory. Tape is used to feed information into a digital computer, and the output information from a computer may also be punched in tape. A computer may be used to control an automatic store system in a factory, in conjunction with an integrated transport system.

Another system, in which -1 , 0 and $+1$ are

used, is known as the ternary code. It has not been applied to anything like the same extent as the binary code. Both binary and ternary codes can also be recorded on magnetic tape.

CONCLUSION

There is no doubt that many industries and businesses will soon find that punched paper tape and the binary code are indispensable tools. Their use enables the work to be performed more rapidly, increases its accuracy and reduces its cost. Other advantages are also gained, which are not immediately obvious, but which can result in very substantial additional savings. The application of punched tape or cards to machine tool control and to other control functions must be fully exploited to permit rapid expansion of business and industry.

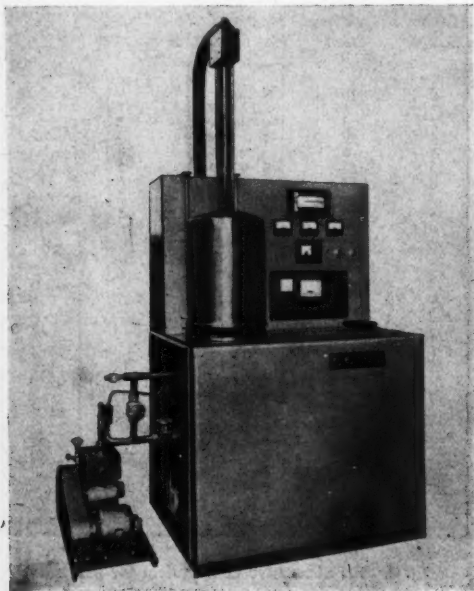
Goulding High-temperature Vacuum Furnace

Introduced recently by Goulding & Partners (Consultant Engineers), Ltd., Essex Road, London, W.3, the vacuum furnace shown in the accompanying figure is intended for use in research or pilot plant development work, and can be operated at temperatures up to about 1,500 deg. C. It is built from a number of unit assemblies, and main-

tenance or subsequent modification is thereby facilitated.

Electrical resistance heating is employed, and the coiled elements, which can be of either tungsten or molybdenum, are supported by two ring-type formers. These formers may be of a size and shape to suit the individual requirements, and the use of ceramic in their construction is avoided, to permit operation at high temperatures with low risk of contamination. A number of circumferential and end radiation shields provides for reducing heat losses from the hot zone, and the water-cooled stainless steel case is counterbalanced, to facilitate removal. If required, mechanical manipulators can be supplied for handling the hot work. Power supply to the elements is adjusted by means of a manually-operated variable transformer, and provision is made for automatic control of temperature, when the desired conditions have been obtained.

Standard backing and diffusion pumps are employed for evacuating the vacuum chamber, and a pressure of approximately 0.00001 mm. of mercury can be obtained when operating at a temperature of 1,000 deg. C. The backing pump is isolated, to minimize vibration.



Goulding high-temperature vacuum furnace, which is intended particularly for use in research or pilot plant development work

East German Machine Tools at the Leipzig Fair

By R. E. GREEN, Associate Editor

EARLIER ARTICLES in this series* have been concerned with some of the new and improved machine tools which were shown in the part of the main machine tool pavilion occupied by factories situated in Eastern Germany at the recent Leipzig Spring Fair. These articles were devoted to lathes and drilling, boring, jig-boring, milling, grinding, honing, and thread-rolling machines, also a milling machine converted for slicing semiconductor materials. Here, attention is drawn to some developments in connection with equipment for sheet metal-working and hot- and cold-forming.

AUTOMATIC CROPPING, HEATING AND FORGING LINE

The general view in Fig. 1, shows part of an automatic billet cropping, induction heating, and forging line on the stand of VEB Pressen & Scherenbau, Erfurt, Schwerborner-Str., 1. It is designed to produce forgings for pipe-line flanges at the rate of 720 per hour, and this line will be supplemented, in the final installations, by a second induction heating furnace of similar capacity, also a trimming press, and will incorporate an inspection station at which the cropped billets will be weighed. Only those billets of the correct weight will then be passed through the furnaces to the forging press.

Bar of 3.5-in. square section bar is cut into lengths of 4.5 in. on the type ScPK (FLe) 500, cropping machine at the right in Fig. 1, which is rated at 500 tons, and will operate at speeds

up to 25 strokes per min. The press is driven from a 40-h.p. motor, and the transmission incorporates an air-operated clutch and brake, controlled by a stop-switch. Bars from the track in the foreground are fed automatically along the grooved rollers, which are driven by the motor at the right. When the end of the bar operates the stop-switch, the feed is interrupted and the machine clutch is operated to cut off the billet. An air cylinder beneath the feed track then raises the bar slightly to clear the lower cropping blade so that the next feed motion can take place.

After they have been cropped from the bar, the billets fall on to a short conveyor on which they are moved, in turn, to a position in front of the ram of an air cylinder, at the right of the track. When this cylinder is actuated, a billet is pushed on to a continuously-driven inclined conveyor (seen near the centre in Fig. 1). Slats on

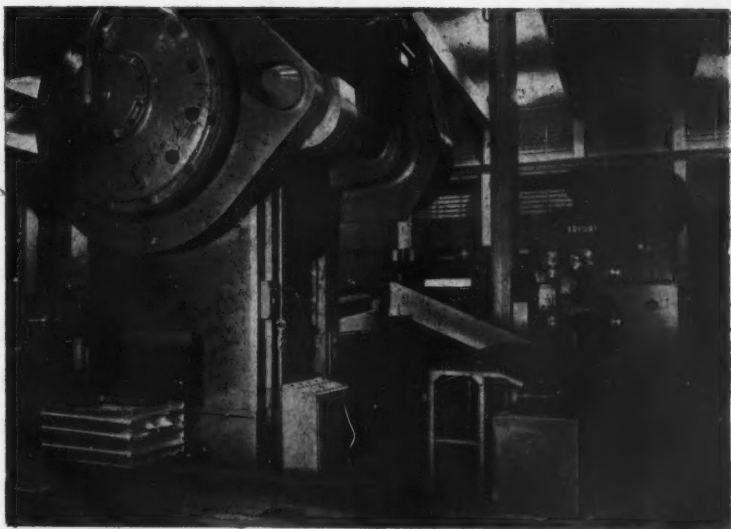


Fig. 1. On this automatic line for the production of pipe flange forgings, billets are cropped from the bar on the machine at the right, fed into an induction-heating furnace, and forged to shape in two stages on the press at the left

* MACHINERY, 98/939-26/4/61, 98/1006-3/5/61 and 98/1074-10/5/61.

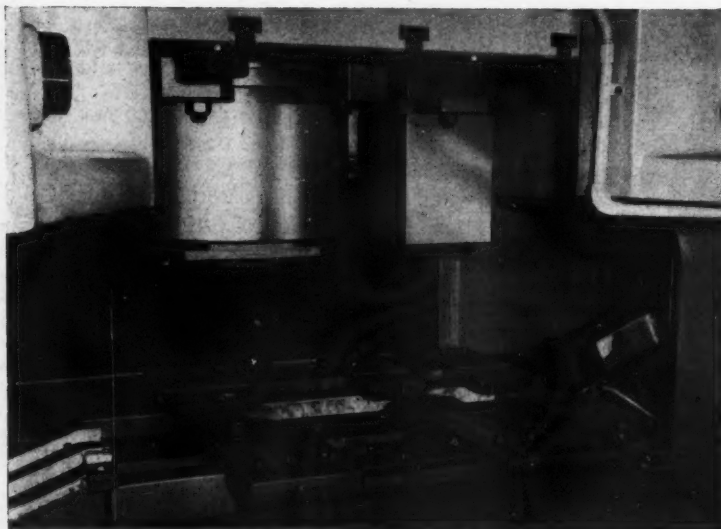


Fig. 2. Close-up view showing the transfer equipment and tooling fitted to the forging press at the left in Fig. 1. The heated billet is first flattened to a thickness of 1.5 in. and then advanced to the final forging position

this conveyor carry the billets up to a platform in front of another air cylinder, whereby they are fed into the guideways of the induction-heating furnace. This furnace is rated at 500 kW., and is supplied with alternating current of 2,400 c.p.s. frequency. Billets travel through the furnace, which is 11 ft. 6 in. long overall, in a continuous line, and are delivered at the rate of one every 10 sec.

At the outlet end, they reach a more sharply inclined chute, down which they pass to the loading position of the transfer mechanism for the 2-station forging press, seen at the right in the close-up view in Fig. 2. The chute outlet is closed by an L-shaped stop, which is pivoted at

the corner of the L, and when it is operated, the hot billet is raised to a vertical position between the first pair of transfer fingers. There are three pairs of these fingers, and the fingers of each pair are carried by air-operated slides on opposite sides of the

press bed. The slides are movable in both the transverse and longitudinal directions, and after the fingers have closed, the billet is moved to the first forging position, at which it is flattened to a thickness of 1.5 in.

At the next position, forging to the required shape is completed, and the flange is finally carried out of the press to the left. Of the single-

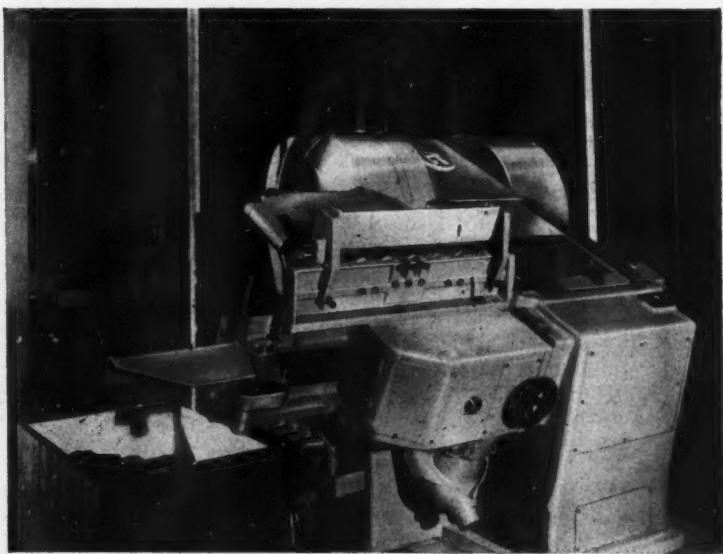
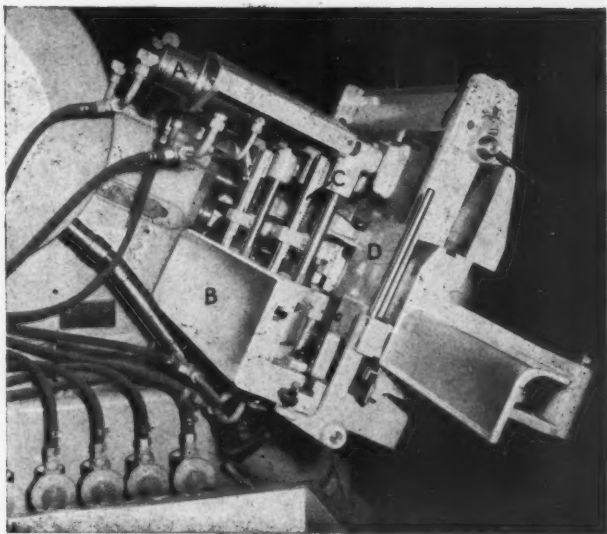


Fig. 3. Duplex tooling is provided on this 40-ton crank press for blanking and drawing container lids at the rate of 300 per hour from specially-prepared sheets with notched edges

Fig. 4. Close-up view showing the automatic feeding mechanism for the special sheets employed on the press in Fig. 3. The sheets are transferred from the magazine by means of suction pads on the rams of air cylinders, as at A



crank type, the press has a capacity of 2,500 metric tons, a width between the uprights of 4 ft., a stroke of 15.75 in., and a daylight of 3 ft., and will operate at speeds up to 55 strokes per min. The completed flange has a diameter of 8.6 in., and is 0.67 in. thick, with a central hole, which is later cleared by a trimming tool, of 3.9 in. diameter.

AUTOMATIC LINE FOR CONTAINER LIDS

An automatic line for the production of drawn container lids at the rate of 300 per min. was shown on the stand of VEB Blechbearbeitungsmaschinenwerk, Aue, Str. der Befreiung. At the head of this line there was a PKXD 40, open-fronted, inclined, crank-type press, as shown in the foreground in Fig. 3. This press is of 40 tons capacity, and can be operated at rates from 150 to 300 strokes per min. For the set-up illustrated, the press was equipped with two combined blanking and drawing tools arranged in staggered positions. Tinned sheets with notched edges, to reduce the amount of scrap material, are fed from the automatic magazine at the left.

This magazine is seen in the close-up view in Fig. 4, and the sheets are supported in a plane parallel to that of the press bed, above the feed mechanism, the lower edges being supported on stops. The top sheet of the stack is picked up by four pairs of suction-type lifting pads, two pairs being carried on the ram of each of two air cylinders A. These air cylinders and others employed in the automatic feed mechanism, also the suction pads, are controlled through valves which are operated in synchronism by cams driven from the press crankshaft.

Just before the upper sheet of the stack is moved, two other air cylinders, beneath the housing B, arranged at 90 deg. to the pick-up cylinders, are actuated. The ram of each of these cylinders is connected to a cross-piece of slotted construction, carrying a small pinion. The teeth of the pinion mesh with a fixed rack, as at C, on one side, and with a movable rack (not visible) on the other.

Each movable rack carries a slotted gripper head D, and when the cylinder is actuated this head is raised through a distance which is twice the stroke of the ram, to a position just above the upper edges of the sheets in the magazine.

With the grippers raised, the top sheet is moved out of the magazine by the cylinders A, to a position in which the upper edge is aligned with the gripper slots. The air supply to the gripper-raising cylinders and to the suction pads is now reversed, with the result that the sheet is released and is carried downwards by the grippers into line with the roller feed mechanism of the press. A mechanically-operated pusher then moves the sheet into the rolls, which are driven by a universally-jointed shaft from the press crankshaft and synchronized with the ram movements.

The feed mechanism is so arranged that the notches in the sheet edges are positioned opposite the staggered punches. The blanked and drawn components pass down through the tool, and the scrap strip is carried away by another roller feed which incorporates a guillotine whereby it is cut into small pieces. The drawn workpieces roll down narrow chutes from the two tool positions, into elevator units each of which is provided with a pair of continuously-driven flat conveyor belts. These elevator units, also the four type GAD 0-5, automatic forming machines which they serve, may be seen in Fig. 5.

From the top of each elevator, the workpieces run down other chutes to the loading positions of the forming machines, which are here arranged

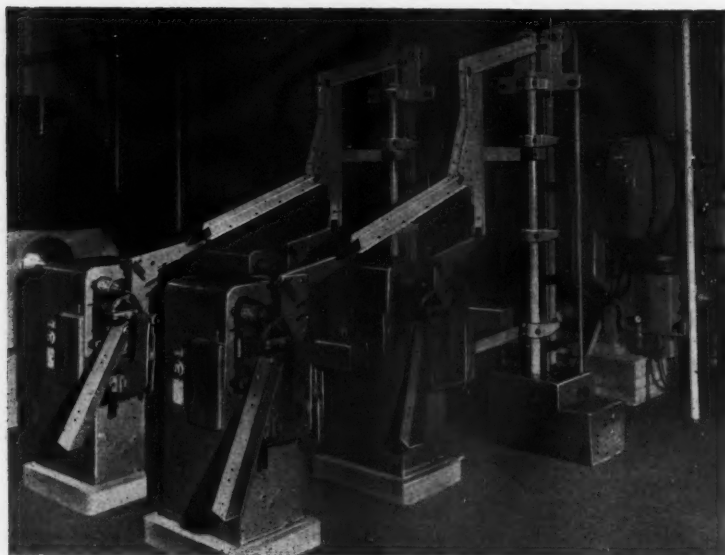


Fig. 5. From the tools on the press in Fig. 3, the drawn blanks are transferred by chutes and elevators to one of four automatic edge-rolling machines, each with a capacity of 75 pieces per min.

for simple edge-curling, although thread-forming and other operations can also be performed if required. Similar tooling is provided on all the machines, and at each loading position, the components are released by a stop which is indexed at each machine cycle. The leading piece then falls on to support pins on the face of a semi-circular plate, carried on two horizontal shafts in front of the continuously-rotating, rolling tool spindle. In front of this spindle there is a bracket carrying a mushroom-headed loading plunger, to which the shafts for the semi-circular plate are also attached.

The plunger is moved forward by a cam and lever arrangement, to push the workpiece over the rolling tool, which has a peripheral groove and is about 0.5 in. smaller in diameter than the component. Another cam and lever arrangement then brings down the forming roll, which has a peripheral projection, and serves to form

the edge of the piece over the edge of the groove in the tool. The forming roll is then retracted, and the loading plunger is moved away from the formed lid. This action brings pointed studs on the semi-circular plate into contact with the rolled-over edge of the lid, to raise the latter until the

upper portion is clear of the groove. Further movement of the plate carries the lid off the rolling tool and it can then slide off the pointed studs, out of the machine. Each of the machines shown is designed to operate at speeds up to 75 pieces per min., and will roll threads in sheet up to 0.019 in. thick, on blanks of 0.39 to 3.9 in. diameter.

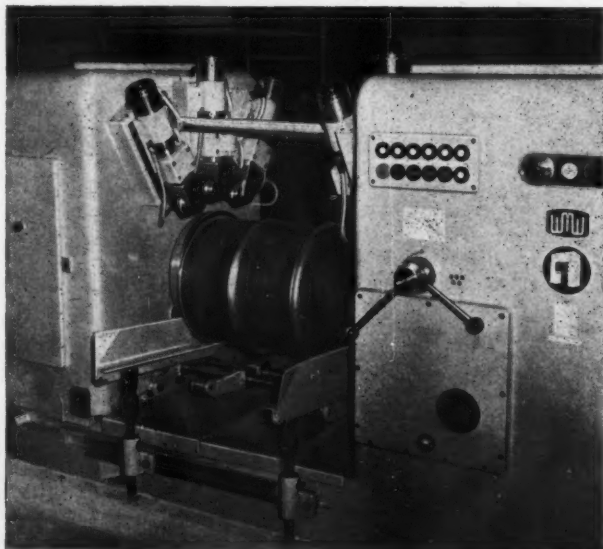


Fig. 6. Hydraulic rams advance large discs to grip the ends of drums to be closed on this special rolling machine. Closing is then performed by means of rollers on rams mounted on the inner faces of the two housings

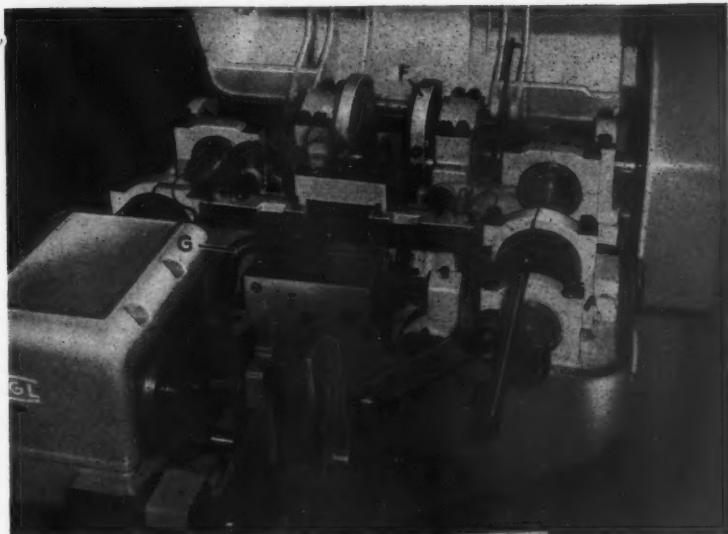
Fig. 7. On this special nail-making machine, two wires are fed simultaneously, and outputs up to 1,000 per min. are obtainable from wire of 0.08 to 0.11 in. diameter

CLOSING MACHINE FOR OIL DRUMS

Another example of the equipment built by VEB Blechbearbeitungsmaschinenwerk is the newly-introduced type KEVFW 630 machine shown in Fig. 6, which provides for closing oil drums and similar containers by rolling over the edges of the drawn ends. Drums which range from 12.59 to 24.8 in. diameter and from 12.59 to 39.37 in. long can be accommodated on the machine, and metal of thicknesses from 0.031 to 0.069 in. can be employed for the drum ends. The machine is hydraulically powered, and the pump unit, driven by a 3.3-h.p. motor, is enclosed in one of the large housings, and the 20-h.p. driving motor, for the rotation of the drum, in the other.

Provision is made for controlling the rolling cycle either by hand or automatically, and up to 360 drums per hour can be handled if the supply arrangements are suitable. Drums may be delivered to the machine with their ends already in position for rolling, or the ends may be loaded separately. With the latter system, the end is held in position magnetically until it is pressed on to the drum opening by means of two large discs attached to shafts in the side housings. When a drum body has been fed into the machine down the chute provided, and the cycle-start button pressed, the drum is lifted to a height at which its axis is aligned with those of the side shafts.

This raising movement is obtained by means of two shafts beneath the drum, which are turned by hydraulic cylinders in one of the side housings. Each shaft carries a lever with a forked end in which a roller is mounted, and as the levers are moved inwards, the rollers make contact with the drum and raise it. The clamping discs are then advanced to press the drum ends into place, or to apply pressure to them if they have been pre-assembled, and the drive is started to rotate



the drum. A gearbox gives a choice of six speeds, from 177 to 441 r.p.m., which are selected by means of two levers on the right-hand housing.

The clamping discs are of such a diameter that they fit within the dished ends of the drum fairly closely, and provide support against the thrust exerted by the forming rolls. These rolls are carried in slotted attachments on the rams of three hydraulic cylinders which are mounted in dovetail ways on the inner face of each of the large housings. The rolls are of slightly different forms, and as they are fed downwards, the metal of the drum ends is progressively rolled over the drum body. The stroke of each of the first two rolls is limited by a stop, but the third roll, which serves to finish-roll the metal to form a tight joint, travels down until it is arrested by contact with the drum after the operation has been completed.

DUPLEX NAIL-MAKING MACHINE

Nails can be produced at rates up to 1,000 per min., from wire which is fed from two coils simultaneously, on the type PAST 4 machine shown in Fig. 7, built by VEB Kaltverformungsmaschinenwerk, Karl-Marx-Stadt., W, 9, Erzberger-Str., 1-3. The mechanism is normally totally enclosed by a large cast cover, here shown in the raised position, and wires of 0.08 to 0.11 in. diameter are fed through a roller-straightening unit by means of the crank-operated mechanism in the left foreground. By adjustment to the feed mechanism, nails of lengths up to 4.3 in. can be produced, and



Fig. 8. Eight diamond dies, each of which gives a reduction of area of 13 per cent, are employed on this special machine for hot-drawing of molybdenum or tungsten wire from 0.0197 to 0.0016 in. diameter

the wires pass through holes in the die-holder *E*, to a position in front of the heading tool.

This tool is carried on the end of a slide operated by the crankshaft *F*, which is driven through V-belts from a motor of 6.7 h.p., at the rear of the machine. There is a choice of three speeds from 300 to 500 r.p.m., or a steplessly-variable reduction unit can be provided. Bevel gears on the crankshaft drive two other shafts, which are parallel with the direction of motion of the heading tool and serve to operate the pointing and cutting-off tool-slides, and the feed mechanism. After the wires have been headed, they are advanced to give the pre-set nail length, and the tool-slides then move in to perform the pointing and cutting-off operations. Finally, the nails are positively ejected by a lever *G*, operated by the feed mechanism, and slide down a chute, out of the machine.

SPECIAL MACHINE FOR HOT-DRAWING MOLYBDENUM WIRE

The special machine shown in Fig. 8, which is designated type UDZGW/VIII/8, was exhibited by VEB Drahtziehmaschinenwerk, Grüna, Mittelbacher-Str., 12, and is intended for hot-drawing molybdenum and tungsten wires. There is pro-

vision for a maximum of eight diamond dies, each of which gives a reduction in area of 13 per cent, and with the set-up demonstrated, wire of 0.0197 in. diameter was reduced to 0.0016 in. Drawing speeds can be steplessly-varied from 65 to 262 ft. per min. From a spool on a bracket at the left-hand end of the machine (not visible), wire is passed over two pulleys, each with eight diameter steps. Between the pulleys, the wire passes through the cast box *H*, which houses an arrangement for continuous lubrication, and then through the heater box, here shown with the cover raised.

The cover carries the heating elements, and when it is closed, the elements are disposed along-

side the wire. Heating is effected by resistance, the elements being supplied with current at 16 volts to provide temperatures from 500 to 750 deg. C., or 24 volts for temperatures from 750 to 875 deg. C., ± 25 deg. C. A switch gives five different settings in each of these ranges. At the right-hand end of the heater box, and shielded from the direct heat of the elements, are the diamond dies through which the wire is drawn. Equipment provided enables the end of the wire to be electrolytically reduced to facilitate threading.

Provision is made for stopping the machine automatically, should the wire break, also when the supply is exhausted, and a warning lamp is then illuminated. Power for drawing the wire is supplied by a motor of 3.3 h.p., which drives the spool at the right-hand end of the bed.

ZEISS MEASURING EQUIPMENT

Several new instruments were included among the range of precision measuring equipment on the stand occupied by VEB Carl Zeiss, Jena. Among them was the instrument shown in Fig. 9, for measuring the diameters of small holes from 0.078 down to 0.002 in. It is stated that measurements can be made to accuracies of the order of ± 0.000024 in. The component with the bore to

be measured is clamped to the circular stage, which has a height adjustment of 1.18 in., and can be rotated and moved in two directions by knurled wheels.

Measuring is carried out by means of glass spheres, integral with short glass stems, which are clamped in a holder within the body of the instrument. The diameter of the sphere is selected to suit the size of the bore to be measured, and after the bore has been centred in the field of view of the microscope, the stage is lowered so that the sphere enters the bore. Sideways movements are then imparted to the stage, to bring opposite walls of the bore in the workpiece into contact with the sphere.

An indication of the position of the sphere in relation to the wall is given by the reflection in the surface of the highly-finished bore. There is also a warning light which is illuminated when contact is made.

The contact positions are measured by means of the fixed microscope above the stage, which has a magnification of $75\times$, and a graticule graduated in divisions of 0.001 mm. (0.00004 in.). The bore diameter is then calculated by means of a simple formula. For measuring a tapered bore, the component is mounted on a wedge of such an angle as to bring one wall of the bore to a vertical



Fig. 9. Small bores of diameters from 0.078 down to 0.002 in. can be measured with the aid of glass spheres, integral with stems, on this instrument made by VEB Carl Zeiss, Jena

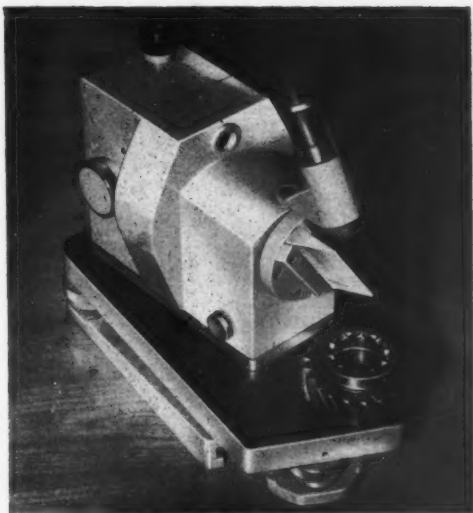


Fig. 10. This VEB Carl Zeiss, Jena, instrument provides for measuring the helix angles of gear teeth to within 5 sec. A wedge-shaped glass straight-edge is coated with light oil to indicate the contact area

position. Measurements can then be made at different heights.

HELIX ANGLE TESTER

The instrument shown in Fig. 10 is designed for testing the helix angles of gear teeth of 1.5 to 20 module, with face widths exceeding 0.78 in., and for this purpose the gear to be tested is normally held in a vertical position on an arbor. The instrument is supported on a surface plate at right angles to the gear axis, and is moved towards the gear until contact is established between one face of the wedge-shaped straight-edge and the tooth face to be checked. The glass wedge is held on the end of a shaft in the instrument, and during the preliminary adjustment this shaft is free to turn as the two faces are moved into contact.

Light oil is applied to the contact face of the wedge, and it is illuminated by a small lamp. The extent of contact between the two faces can be easily observed through the glass since the oil film becomes transparent at the contact areas. Within the body of the instrument, a precision scale is mounted on the shaft, and readings to 5 sec. of arc can be made with the aid of the

lamp, light being directed through a window in the housing. The instrument can also be employed for measuring a test gear while still in position on the gear-cutting machine, or for measuring large gears while resting directly on a surface plate.

A special form of the helix angle tester, fitted

with a bubble level instead of a straight edge, can be supplied for precision setting of angles on such machine tools as gear grinders.

Other new instruments introduced by the company will be discussed in a later article to be published shortly in **MACHINERY**.

Blakeslee "Tri-Finish" Equipment for Degreasing, Phosphating and Painting

George H. Alexander Machinery, Ltd., 82-84 Coleshill Street, Birmingham, 4, have recently been appointed distributors in this country for the new range of "Tri-Finish" equipment for degreasing, phosphating and painting metal parts, made by G. S. Blakeslee & Co., Chicago, Illinois, U.S.A.

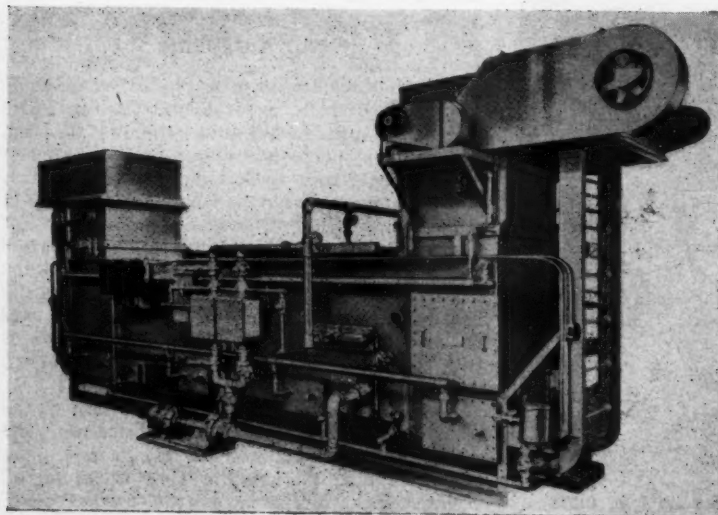
"Tri-Finish" equipment is usually built to meet customers' particular requirements, and is available in three basic types, the first of which provides for vapour degreasing and painting with trichlorethylene-thinned paints, which are applied to the work at a temperature near to the boiling point of the solvent, namely, 188 deg. F. These operations are carried out in a single unit, which occupies comparatively little floor space, and, on account of the high temperature of the solution, the thinning agent quickly evaporates when the work

is unloaded. It is stated that virtually all paint over-spray and excess solvent can be recovered, and that in many instances, solvent recovery from the painting stages suffices for degreasing.

With equipment of the second type, vapour degreasing, and anhydrous phosphating, are carried out with a mixture of phosphating chemicals dissolved in trichlorethylene, which is heated to boiling point so that a vapour zone is provided above the solution. With this arrangement, a strongly-adherent iron phosphate coating is applied to the work, which forms a high-quality base for subsequent painting.

Equipment of the third type enables vapour degreasing, phosphating, and painting to be carried out as a continuous process. If required, this equipment can be supplied with provision for stoving components which have previously been painted.

Other products in the Blakeslee range, which are being handled in this country by George H. Alexander Machinery, Ltd., include washing machines for metal parts, degreasing plant, quenching units, and pickling equipment. The illustration shows an automatic degreasing plant of the vapour-spray-vapour type, which incorporates a continuous conveyor system for the work, and is intended for handling bodies for carburettors. Loading and unloading of components can be carried out at either end of the plant.



This Blakeslee automatic vapour-spray-vapour degreasing plant for carburettor bodies incorporates a continuous conveyor system

Some Aspects of Marine Engine Building Practice

Examples of Set-ups, Machines, and Equipment in Use at the Works of Harland & Wolff, Ltd., Belfast

By A. W. ASTROP, Associate Editor

THERE IS DEFINITE EVIDENCE of ship-building activities in the Belfast area in the early part of the 17th century, and there are records which indicate that the suitability and potentialities of the site for that industry were recognized as early as 1584. Ship-building was undertaken in Belfast on a progressively increasing scale throughout the 17th and 18th centuries, and it was in 1854 that Edward Harland took up an appointment as manager of Hickson's yard on Queens Island. Previously, he had served an apprenticeship with Robert Stephenson & Co., Newcastle-upon-Tyne, and after being employed by that company as a journeyman for a short period he took a position with J. & G. Thomson, marine engine builders in Glasgow. Soon, however, he returned to the Tyne as manager of Mr. Thomas Toward's yard, and it was at this point in his career that his outstanding qualities as a ship engineer emerged.

When he became manager of Hickson's yard, Belfast, he had only had three years' experience after completing his apprenticeship, and four years later, in 1858, he acquired the "interest and goodwill in the shipyard . . . together with steam engine, boiler plant, tools, machinery, and other appliances for shipbuilding . . ." for the sum of £5,000. It is interesting to note that the purchase and transfer of the yard were completed with the assistance of various friends, including an uncle of Mr. C. W. Wolff, his private assistant and, later, his

partner. From that time, Harland and Wolff were names which appeared with increasing frequency and significance in the field of shipbuilding, until they assumed a status in the forefront of the industry which they have subsequently retained.

Complementary with ship-building activities, the company has long been engaged in the production of engines for marine and industrial applications, and the machining and erection facilities provided at Queens Island are impressive from the standpoints of both size and range of equipment installed. The main bay of the engine machining and erection shop is 1,090 ft. long by 84 ft. wide by 67 ft. high, and is served over its full length by travelling cranes, some of which are of 80 tons capacity. By doubling cranes, and with the aid of special lifting beams, loads as heavy as 150 tons can be raised.

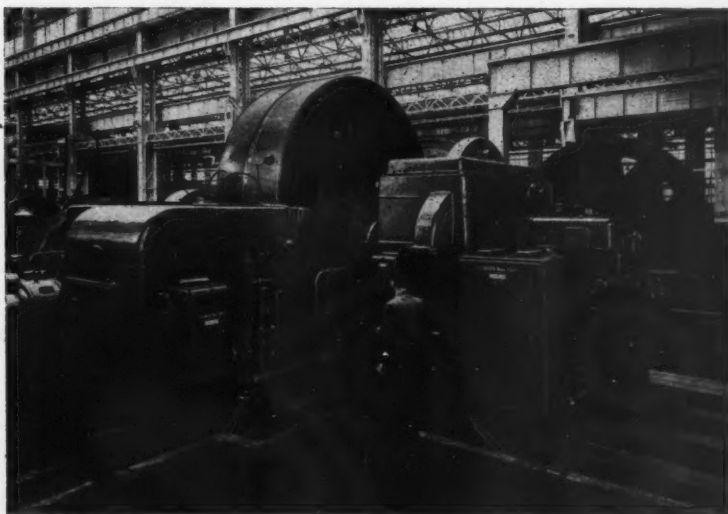


Fig. 1. This shaving machine, by The Power Plant Co., Ltd., is employed for finishing operations on large double-helical reduction gears

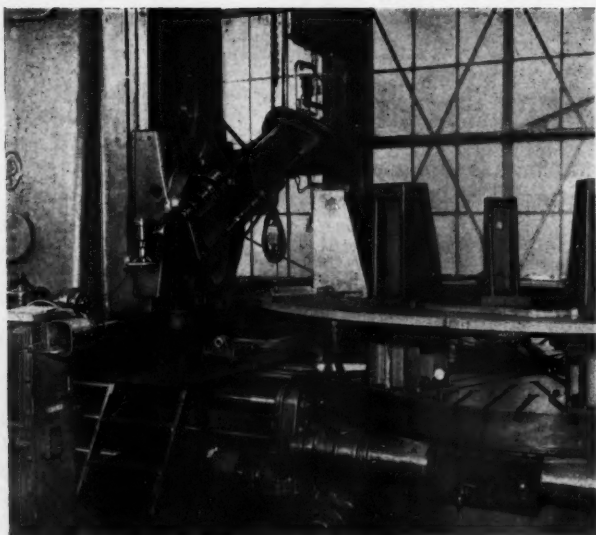


Fig. 2. Close-up view of a large Power Plant gear-hobbing machine which will cut gears up to 15 ft. diameter by 7 ft. 6 in. face width. Another column and hobbing head is provided opposite to that here shown, and with this arrangement upper and lower portions of double-helical gears can be cut simultaneously

Situated in the centre portion of this bay are many of the larger machine tools, including two C.W.B.-Innocenti horizontal boring and milling machines (Henderson & Keay, Ltd., Glasgow) with horizontal and vertical traverses of 28 and 16 ft., a number of large planing and plano-milling machines, a Craven 90-ft. shafting lathe, and several large crankshaft and crankpin turning lathes by Noble & Lund and other makers.

Erection and testing of diesel engines are carried out at one end of this large bay, and at the other end there are facilities for testing turbines. Beyond these test beds are many other large machine tools, among which may be noted, for example, turbine gear hobbing and shaving machines by The Power Plant Co., Ltd., West Drayton, with capacities for gears up to 15 ft. diameter. A general view of the shaving machine, which will also handle pinions down to 12 in. dia-

meter, is shown in Fig. 1, with a large double-helical reduction gear in position. In this illustration, the cutter head can be seen at the left and the work-head at the right. A close-up view of the hobbing machine is given in Fig. 2, where a typical fixture for supporting a large diameter gear blank is seen in position on the table.

At the tops of the cast columns, seen projecting from the fixture, there are T-slots whereby clamps are applied to hold the blank during hobbing.

The vertical column and hobbing head slide seen at the left are repeated at the opposite side of the work-table, and with this arrangement one head can be operating on the lower portion of a double-helical gear, while the other is operating

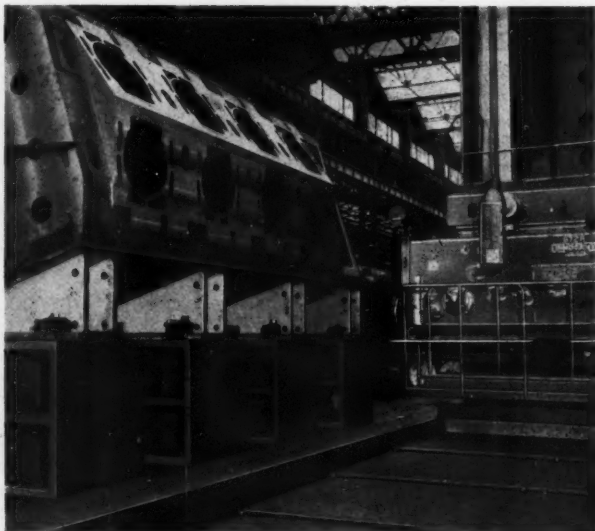


Fig. 3. One of the two large C.W.B.-Innocenti travelling column milling and boring machines installed at the engine works is here seen set up for operations on a cast-iron cylinder block

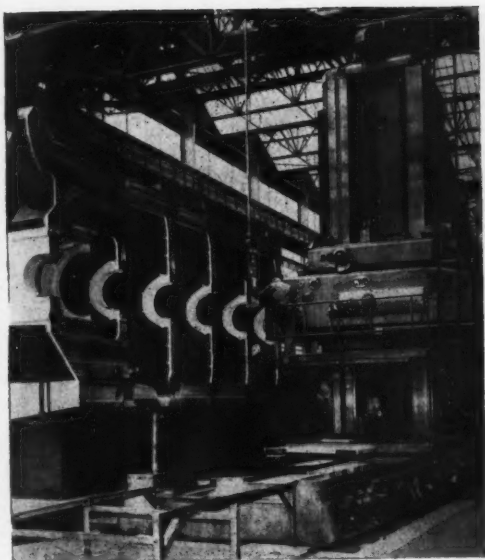


Fig. 4. At this set-up on a C.W.B.-Innocenti machine, facing and boring operations are carried out on a diesel engine bed plate

on the upper portion, for example. This machine will accommodate gears with face widths up to a maximum of 7 ft. 6 in.

Extensive use is made of the C.W.B.-Innocenti boring and milling machines for operations on such components as diesel engine bed plates, scavenge belts, and cylinder blocks, and a typical set-up for machining one of the latter workpieces is shown in Fig. 3. It will be noted that the casting is mounted on its side and it is supported by four large fabricated wedges. The angle of these wedges is such that one head face of the casting is brought to the vertical plane, to permit machining, in a series of passes with a large-diameter milling cutter. At the same setting, various holes can be bored accurately at right-angles to the previously machined face. For operations on the other angular face, at the top in the figure, the wedges are reversed, and the workpiece is replaced.

In Fig. 4, a C.W.B.-Innocenti machine is shown set up for facing a large bed-plate for a diesel engine, and it may be noted that this component is bored at the same setting. For the latter opera-

tion, the ram of the machine is fitted with a right-angle attachment, the spindle of which carries a milling cutter of the required diameter. With this arrangement, the half bores seen at the centre of the bed-plate are machined during a longitudinal pass of the column. At the end of the bed-plate nearer the camera in Fig. 4 there is a number of arcuate pads, which require to be machined to receive a thrust bearing unit.

The radius of these pads is greater than that of the half-bearings, but it is struck from the same centre, and they are machined in the manner shown in the close-up view Fig. 5. A right-angle attachment drives a type of facing head on which the slide member A can be adjusted to provide the required radial setting of the tool. There are slots at each end of this slide, and on each side, in which a tool can be located and secured by a simple strap clamp. In Fig. 5, the six arcuate pads, in two groups of three, can be clearly seen, as can the end half-bearing, which was machined with a milling cutter in the manner described above.

Previously, facing and boring operations on bed-plates and other components requiring such machining were carried out at separate set-ups,

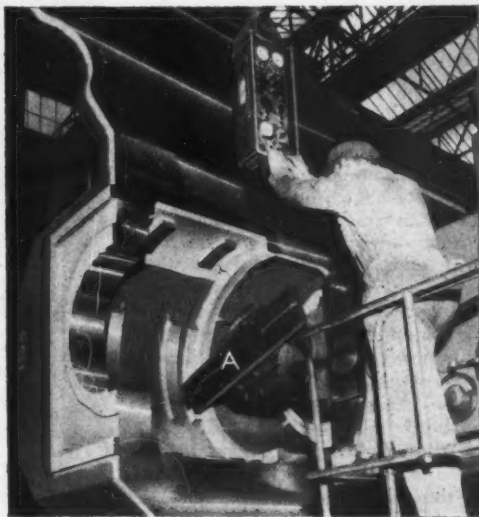


Fig. 5. For boring operations, the ram of the C.W.B.-Innocenti machine is fitted with a right-angle attachment, as here shown. This set-up provides for machining arcuate pads to which a thrust bearing is subsequently secured

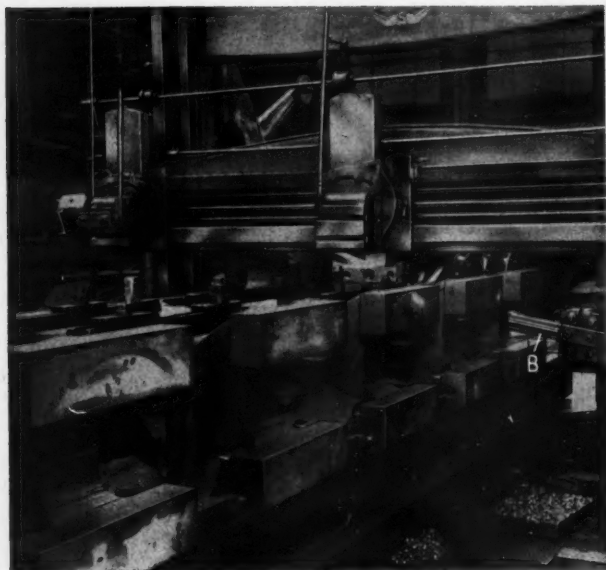


Fig. 6. Planing operations on a complete set of six forged steel connecting rods for a marine diesel engine are performed at this set-up on a Stirk Hiloplane machine

and on separate machines, and the methods employed with the C.W.B.-Innocenti machines have resulted in substantial reductions in machining and set-up times, and consequently in production costs.

SOME PLANING, MILLING AND GRINDING OPERATIONS

In Fig. 6 can be seen five of a batch of six connecting rods which are set up on the table of a Stirk Hiloplane machine for an operation on the forked ends. Machined from steel forgings, the rods form a complete set for a 6-cylinder, 620-mm. diameter bore engine, and the planing operation provides for machining an arcuate portion at the end of each rod, to provide clearance for the associated cross-head. In the as-forged condition, the forked end (nearer the camera) is solid, and at the first operation three holes are drilled—one at each end of the arcuate clearance and

one at the approximate mid-point. Bandsaw cuts are next made from the end face of the forging to the outer holes, then inwards from the latter to join up with the centre hole. With this arrangement the bulk of the metal at the solid end is removed, to provide the forked shape seen in the figure.

Subsequently, the throat of the fork is machined to the required arcuate shape, with large radii at the ends of the arc, at the set-up in Fig. 6. The right-hand side box only is employed, and is fitted with the special extended tool-holder *B* which incorporates a round-nosed high-speed steel tool. After machining the upper half of the throat, the tool and holder are re-set to machine the lower half. The cutting speed employed is 60 ft. per min.

A machined clearance for a cross-head is also required on another type of connecting rod—for the Cooper-Bessemer gas engine, which the company make in large quantities. The rod for this type of engine is also machined from a steel forging, but is smaller and of more complex form.

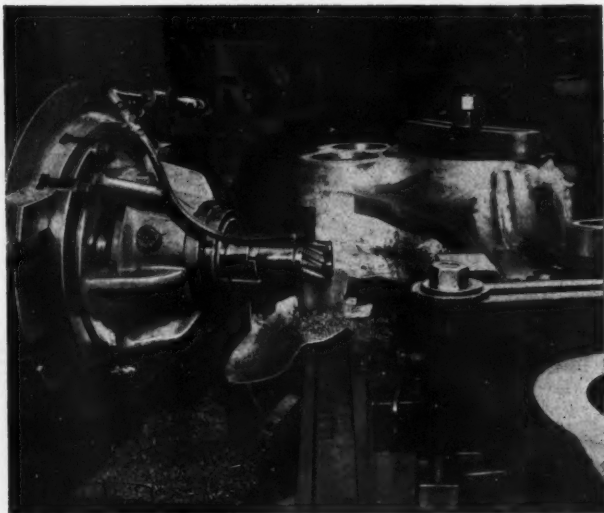


Fig. 7. Heavy metal removal from the throat of a forged steel connecting rod is performed on this Craven horizontal boring and milling machine with a 3 1/2-in. diameter Strassmann cutter

A typical rod is seen set up on the table of a Craven horizontal boring and milling machine in Fig. 7, where the large end is remote from the camera. The operation involves the removal of a large amount of metal at the root of the fork in the rod, and is performed with a Strassmann cutter (Teroy, Ltd., Central House, Fratton Bridge, Portsmouth). This cutter, which is $3\frac{1}{2}$ in. diameter, can be seen at the centre of the figure and is here set to take a $1\frac{1}{2}$ -in. deep cut.

This cut is made across the full width of the forked end, and the spindle head is subsequently raised to take a second cut, above and overlapping with the first. For these operations, the spindle is run at 63 r.p.m. and the feed rate is 1.8 in. per min. It may be noted that the connecting rod is clamped with its longitudinal centre line parallel to that of the machine table, and that the latter is then swivelled about a vertical axis in order to present the work to the cutter at the required angle.

Another set-up for operations on Cooper-Bes-semer connecting rods of a similar type is shown in Fig. 8. The rods are here seen set up on the table of a Churchill plano-grinding machine, on which a relieving operation is performed on the side cheeks of the big ends. The big-end bearing cap, seen removed from the two rods nearest the

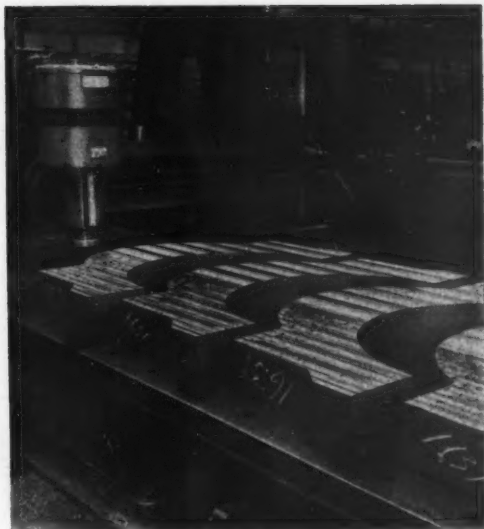


Fig. 9. High-speed plano-milling of forged steel eccentric straps for marine diesel engines is carried out on this converted Buckton planer

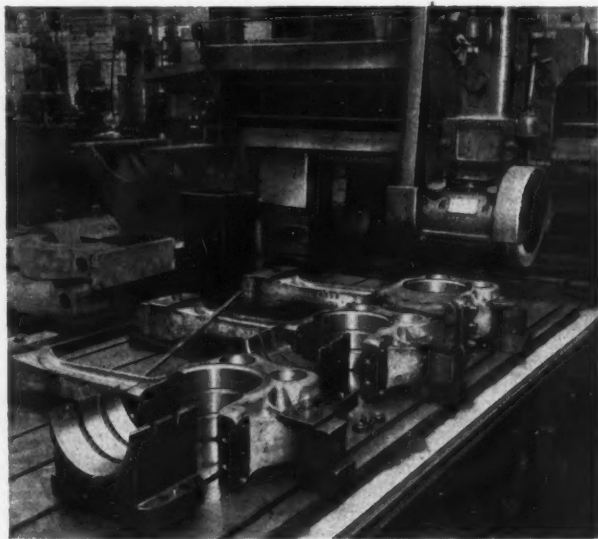


Fig. 8. To relieve the cheek faces of steel connecting rods below the level of the associated cast-iron bearing caps, a grinding operation is performed on this Churchill double-column machine

camera but still in place on the rod in the background, is of cast iron, whereas, as mentioned earlier, the rods are of forged steel. To prevent galling in service, the cheeks of the rod are required to be relieved slightly below the cheeks of the cap. After the caps have been removed, a small amount of metal is ground from the rods by the rail-mounted head. Subsequently, the rods are inverted and a similar operation is carried out on the opposite side. When the cast-iron caps are reassembled, the cheeks of the latter project slightly beyond those of the rod, and any rubbing action during service takes place on the cast-iron surfaces only. The grinding head has an 18-in. diameter wheel and the spindle is carried in Churchill Hydro-auto bearings.

For some components, the company employs high-speed plano-milling techniques, and a typical set-up for this type of operation is shown in Fig. 9. The components here shown are forged steel eccentric straps for a marine diesel engine, and

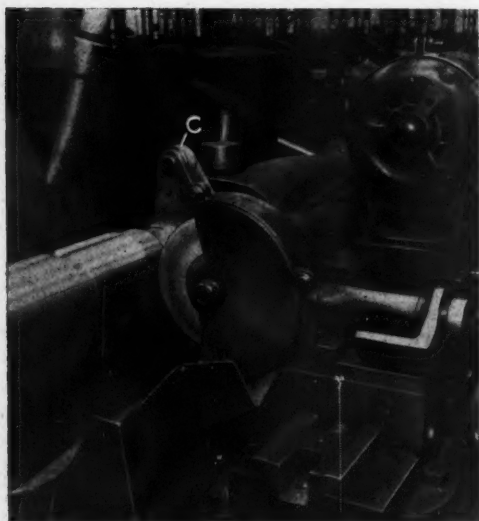


Fig. 10. This thread-grinding attachment, which was designed and built by the company, is used on a Swift lathe for operations on the ends of exhaust piston tie rods

they require to be machined on both sides. For this operation, the company has adapted a J. Buckton & Co., Ltd., planing machine (built about 1912) for high-speed plano-milling by modifying the table drive and fitting a Futurmill (Futurmill Conversion, Ltd.) milling head to the cross-rail tool slide. The head is mounted on the tool slide, in place of the clapper box, and the vertical adjustment provided for the slide is employed for setting the depth of cut.

The milling head is of the 2-speed type, rated at 25/50 h.p., and a 3-in. diameter cutter is used for roughing and a 7½-in. diameter cutter for finishing. Both cutters are of the indexable throw-away carbide-tip type, and the finishing cutter is seen in position in the figure. For roughing, the table is fed at 42 in. per min., and the straps are milled on both sides. Subsequently, they are annealed before being finished machined with the 7½-in. diameter cutter at a feed rate of 60 in. per min. High-speed plano-milling is reserved almost exclusively for steel components, since it was found that the as-cast surface of iron workpieces had an adverse effect on cutter life.

Exhaust piston tie rods for marine diesel engines are made in batches by the company and are sometimes as large as 5 in. diameter by 20 ft. long. These rods have threaded ends, and to

ensure an even distribution of load in service, the threads are ground. For this operation, a grinding head which was designed and built by the company is used in conjunction with a large Swift lathe, and a close-up view showing the attachment in position is given in Fig. 10. The tie rod, a portion of which can be seen in this figure, is 20 ft. long and the threaded end is 5½ in. diameter by 6 in. long. The pitch of the thread is 0.250 in., and it is of Whitworth form.

Of 10 in. diameter by 1 in. wide, the grinding wheel is of the ribbed type and is dressed to the required thread form with the aid of the crushing roll C. This roll is carried in a forked member which is pivoted about the tailstock quill, and with this arrangement it can readily be swung down into the working position when required. The grinding head is a self-contained attachment, comprising a spindle housing and driving motor, and is mounted on the tool-slide of the lathe. Longitudinal traverse of the wheel along the thread is provided by the normal power feed to the saddle, and increments of in-feed for grinding, also for crush-dressing, are applied, as required, by means of the cross-slide movement. Of 1.5 h.p., the motor is of the constant-speed type, and drive is transmitted by way of two V-belts to a pulley mounted on the end of the grinding spindle.

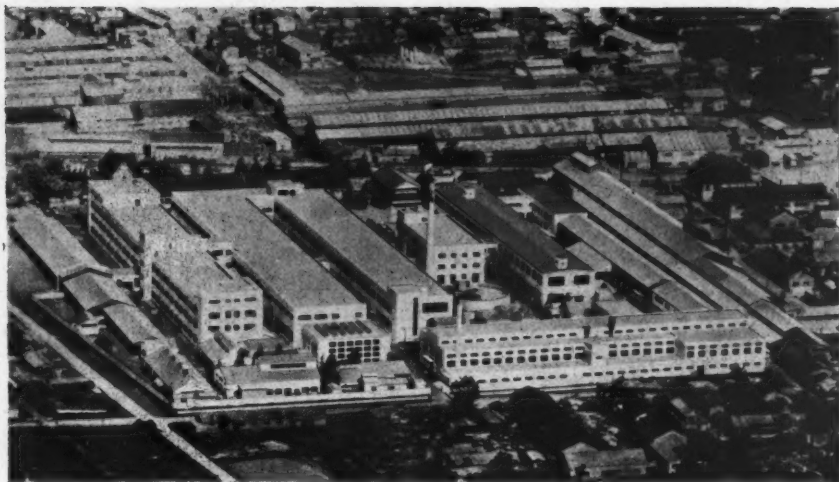
Initially, the thread is cut with a single-point tool, and approximately 0.030/0.040 in. of metal is left on the flanks for finish grinding. For the tie-rod shown in the figure, six grinding passes are required to bring the thread to the required size.

Another article concerned with set-ups, machines, and equipment in use at the engine works of Harland & Wolff, Ltd., Belfast, will appear shortly in MACHINERY.

LIGHT-WEIGHT REACTOR FOR POWER GENERATION. Atomics International, a Division of North American Aviation Inc., California, U.S.A., have developed and constructed, for the U.S. Atomic Energy Commission, a light-weight reactor which is intended to provide an auxiliary source of power for space vehicles.

This new reactor, known as the S2DS, it is stated, weighs 200 lb. without shielding and the fuel is a uranium-zirconium hydride. The core is 13 in. high by 9 in. diameter, and it generates 50 kW. of heat.

In service, the heat that is delivered from the core would be transferred by means of a liquid sodium-potassium coolant to a boiler containing mercury. The resulting mercury vapour would then be fed into a small turbine which would drive a generator to produce 3 kW. of electricity.



Japanese Machine Tool Factories*—9

Tsugami Manufacturing Co., Ltd., Nagaoka

By R. E. GREEN, Associate Editor

THE TSUGAMI MANUFACTURING CO., LTD., was started about 36 years ago by Mr. Taisuke Tsugami, who owned a small factory in Tokyo. Financial assistance from the Japanese government enabled the company which he built up to start production of gauge blocks in 1929, which were among the first high-precision products made in Japan. In March, 1937, at the city's invitation, the factory was moved to Nagaoka, in Niigata Prefecture, about 150 miles from Tokyo. This city, which is situated near the shores of the Japan

Sea, opposite the Chinese mainland, is the centre of a mainly agricultural area, and has about 150,000 inhabitants.

When the factory was started in Nagaoka, under the present title, about 25 people were employed, and the objects were to make machine tools, measuring instruments and small tools of high precision, in addition to gauge blocks. The company made rapid progress, and during the last war, the number of employees rose to about 3,000. In 1945, another factory, known as the Shinshu plant, was acquired at Nakagoma, about 150 miles from both Tokyo and Nagaoka, to provide for expansion. At present, about 1,200 people are employed at the Nagaoka factory, of whom approximately 60 are concerned with production planning and control.

In addition, there are 215 employees at Shinshu, and about 120 at the head office, which is at 1, 4-chome, Tamura-cho, Shiba Minato-ku, Tokyo. Of the head office staff, some 20 are employed on machine tool and instrument design, and the remainder constitute the sales force.

* Articles on the Japanese metal-working industries which have already been published in **MACHINERY** have been concerned with the 4th Osaka International Trade Fair, 96/1212—1/6/60 and 96/1288—8/6/60; Motor Car Production in Japan, 96/1426—15/6/60, 96/1552—22/6/60 and 96/1640—29/6/60; Bicycle Production in Japan, 97/46—6/7/60; Refrigerator Production in Japan, 97/416—24/8/60, 98/176—25/1/61 and 98/640—22/3/61; Electric Motor Production in Japan, 97/708—28/9/60, 97/1276—7/12/60 and 97/1448—28/12/60; Television Receiver Production in Japan, 97/932—26/10/60; Transistor Production in Japan, 98/253—1/2/61; Sewing Machine Production in Japan, 98/468—1/3/61.

The Machine Tool Industry of Japan, 97/108—13/7/60; Japanese Machine Tool Factories, 1. Ikegai Iron Works, Ltd., 97/304—10/8/60, 2. Okuma Machinery Works, Ltd., 97/472—31/8/60, 3. Toyota Machine Works, Ltd., 97/652—21/9/60, 4. The Kawasaki Works of Hitachi, Ltd., 97/1048—9/11/60, 5. Mitsui Precision Machinery & Engineering Co., Ltd., 98/408—22/2/61, 6. Hitachi Machinery Co., Ltd., 98/608—15/3/61, 7. Shibaura Machine Co., Ltd., 98/769—5/4/61, 8. Nippei Industrial Co., Ltd., 98/1067—10/5/61.

Among the products of the company, to which further reference will be made, are Swiss-type and other automatics, universal and precision cylindrical grinding machines, thread-rolling machines, lapping machines, lathes, toolmakers' microscopes, and other precision measuring instruments. Under a technical assistance agreement with the Helicoil Corporation in the U.S.A., concluded in 1951, the company manufactures and markets steel wire thread inserts.

A similar agreement, with the French firm of Cri-Dan, S.A., enables the company to build Cri-Dan automatic high-speed threading machines, for sale in Japan and the Far East. A range of watch-making machines is made (in addition to the Swiss automatics) including types for pivot and pinion leaf polishing, also type mould engraving machines for the production of printers' type matrices. Industrial equipment made by the company includes machines for screen process printing, room air conditioners, compressors for motor car air-conditioning equipment, and automatic vending machines. Equipment for the textile industry is also produced, such as high-speed warp-knitting



Fig. 1. This general view inside one of the buildings at the Nagaoka factory shows the shop in which small tools such as thread-rolls, -chasers, and -gauges are produced. Both Japanese and Western machine tools are employed

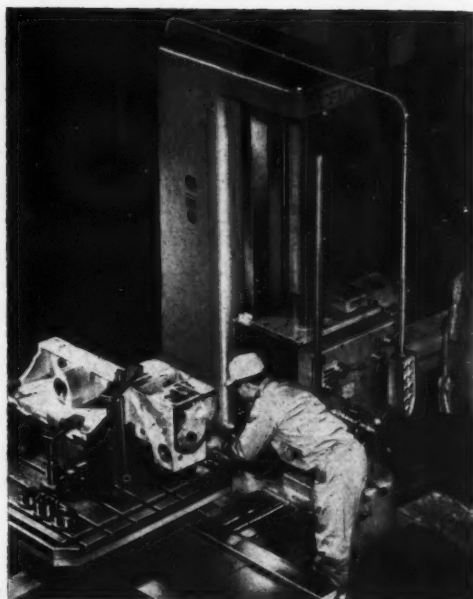


Fig. 2. Among European machine tools installed in the Nagaoka factory is a Wotan horizontal borer, of 3.34 in. spindle diameter, here seen set up for operations on the main spindle housing for a thread rolling machine

and warping machines, dyeing units, and gear-type pumps for use in the production of synthetic fibres.

In addition, the company has manufactured sewing machines, but this venture was abandoned when conditions became too competitive.

THE NAGAOKA FACTORY

As seen in the heading illustration, the factory at Nagaoka consists of a number of buildings, most of which are of two or more storeys, and of steel or reinforced concrete construction. The site has an area of about 820,000 sq. ft., and the floor area of the buildings is approximately 540,000 sq. ft. The Shinshu plant, it may be noted, is built on a site of some 35 acres, and has a floor area of about 290,000 sq. ft. In addition to the factory at Nagaoka, the company has built a hospital for the benefit of the employees, in which a staff of 30 is employed, and it also maintains a technical school, at which apprentices can study in off-duty periods.

The Nagaoka factory has its own foundry, seen at the extreme right in the heading illustration, in which machine tool castings of up to 2 tons in weight are produced. There are three cupolas, of 2, 4 and 6 tons per hour capacity, and a Toshiba high-frequency melting furnace, of 150 kW. rating, for charges weighing up to 330 lb., provides metal for small steel castings. In a fairly extensive heat treatment plant there are large furnaces for artificial ageing or stabilizing of castings, by heating to 500 to 580 deg. C. and soaking for 10 hours, this treatment being repeated if necessary. Both high- and low-temperature treatment of gauge block blanks is also carried out in this department, as will be described.



Fig. 4. All slideway surfaces on castings for Tsugami machine tools are finished by hand-scraping. The scraping area in the shop for the assembly of automatics is here shown

Some indication of conditions inside the factory is given by the general view in Fig. 1, which shows

one bay in the building to the right of the small office block near the centre of the heading illustration. This bay, which forms half of the building, measures some 500 by 72 ft., and is employed for the production of small tools and dies, the range including thread-rolls, -chasers, and -gauges. The factory is well-equipped with machine tools, of Japanese, European and American origin, which are maintained in good mechanical condition. The average age of these machine tools appears to be between 10 and 15 years.

Among recently installed machines is the Wotan (Soag Machine Tools, Ltd.) horizontal

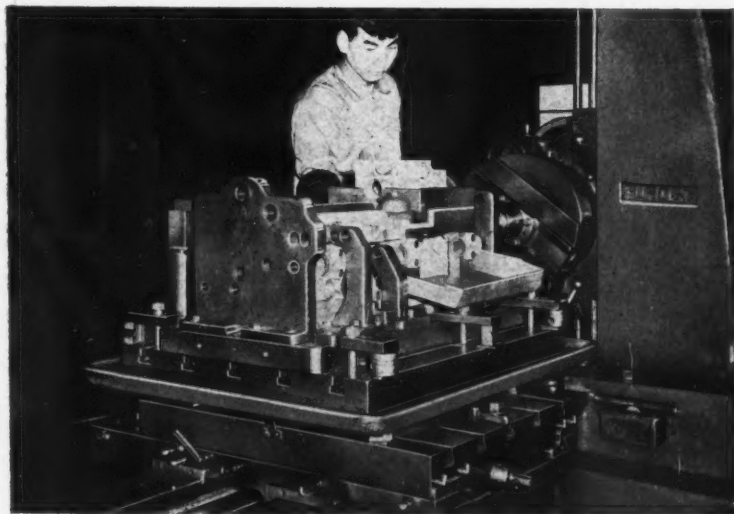


Fig. 3. On this Hirose horizontal borer, a jig is employed to hold the bed casting for a single-spindle automatic, and to guide the various bars for the main spindle, cam-, and drive-shaft bores



Fig. 5. Among the latest equipment installed in the Nagaoka works is this Ikegai-Japax spark-erosion machine, which has a rating of 4 kW. and a maximum metal removal rate of about 0.025 oz. per min.

borer shown in Fig. 2. This machine has a spindle diameter of 3.34 in., and is seen in operation on the main spindle head housing for a type 25 D forming and thread-rolling machine, of 25 tons capacity. Setting-up is repeated for each casting to be machined, but more intensive methods are employed for boring castings for automatics.

An example of the equipment provided is seen in use in Fig. 3, where a Japanese-built Hirose horizontal boring machine is set up for operations on the bed casting for a type 00M automatic. The operations are carried out with special boring bars, in conjunction with the jig shown, which has provision for locating and clamping the casting. With this equipment, the main spindle, cam- and drive-shaft bores in the casting are machined in 15 hours, which is a considerably shorter time than was required with the methods formerly employed.

Among machine tools of Western origin may be mentioned thread grinders by Reishauer, cylindrical grinders by Werner, Heald and Fortuna-Werke, a Maag gear grinder, a Wanderer thread milling machine, and Blohm and Brown & Sharpe surface grinders. Guide-way surfaces, even on small castings, are still finished by hand-scraping methods, and a view in the department in which this work is carried out on slides for automatics is given in Fig. 4. Carbide-tipped scrapers are used.

One of the latest machines provided in the works is the Ikegai-Japax, type D-103, electro-erosion unit seen in Fig. 5, which is made by the Japan Discharge Machining Laboratories, Ltd., 100-

selected by means of a switch on the control panel at the right.

The operation shown in progress provides for cutting three equally-spaced slots, one at a time, in a carbide insert in the end of a guide bush for an automatic screw machine. Details of the tooling can be seen in the close-up view, Fig. 6, where the level of the electrolyte has been lowered so that the end of the guide bush can just be seen at A, projecting from the end of the clamping fixture. The shaft in the head, which normally carries a fixed electrode, has been fitted with a bracket, with bearings for a horizontal spindle. A brass disc, slightly thinner than the 6-mm. (0.024-in.) width of the slot to be machined, is mounted on the spindle.

A small electric motor, housed between the walls of the bracket, drives the spindle at a speed of about 10 r.p.m., and the head is fed down at the rate of 0.005 in. per min. The slot is cut right through the wall of the bush, which is about $\frac{1}{8}$ in. thick, and extends for a distance of approximately $\frac{1}{8}$ in. from the end. Each slot is completed in about 25 min. For normal spark-erosion work, the machine has a maximum metal removal rate of 0.0247 oz. per min., this weight being equivalent to 0.0053 cu. in. of steel.

GAUGE BLOCK PRODUCTION

The production of gauge blocks follows the latest Western practice, being based on the methods employed by a large American company,

Fig. 6. Close-up view of the head of the machine in Fig. 5, showing the brass disc electrode, and its supporting bracket which also houses a driving motor. With this set-up, slots are cut in carbide insert's in a screw machine guide bush



and the blanks, of steel containing 12 per cent chromium and 1.2 per cent carbon, are first machined on a shaper. Roughing on a surface grinder follows, about 0.010 in. being left on all surfaces for the finishing operations, and the blocks are then hardened

by heating them in an electric resistance furnace supplied by Gadelius & Co., Ltd., Tokyo, and quenching in oil. The furnace gives a maximum temperature of 1,200 deg. C., and has a rating of 27 kW.

After they have been hardened, the blanks are subjected to a stabilization treatment at a temperature of -80 deg. C., in refrigeration units supplied

by the Osaka Metal Industry Co., Ltd., and by Cincinnati Sub Zero Products, U.S.A. The blanks are placed in trays in which they are immersed in liquid methanol, to provide for quick and thorough cooling, and to ensure that the transformation of retained austenite to martensite is as thorough as possible. Tempering is then carried out by raising the temperature of the blanks to 150 deg. C., after which they are transferred to the finishing departments for grinding and lapping to size.

Surface grinding is followed by lapping on special machines, of the company's own design and construction. One of these lapping machines is shown in Fig. 7, where it is set up for operation on a load of 12 blanks. These blanks are held in one row of a series of rectangular slots in a thin steel disc to which a planetary motion is imparted by three eccentric pegs near the centre. Above and below the blanks there are cast iron lapping plates of a high degree of flatness, the upper plate being stationary and the lower, either stationary or driven, as required.

Hydraulic pressure, up to 250 lb. per sq. in.,



Fig. 7. One of the Tsugami-designed lapping machines employed for the production of gauge blocks at the Nagaoka works. The blocks are held in slots in a plate which is driven in a planetary path between the laps



Fig. 8. Inspection of gauge blocks to determine whether they are to be included in workshop, inspection or reference sets is performed on this Carl Zeiss, Jena, instrument, with which readings to 0.000008 in. can be obtained

may be applied to the upper lapping plate, after it has been lowered into contact with the top faces of the blanks by means of a rack and pinion arrangement actuated by the lever which the operator is holding. The pressure applied is registered on the dial gauge above the upper lapping plate shaft. During lapping, the dimensions of the blanks are frequently compared with those of a master, with the aid of comparators of varying degrees of sensitivity. Mechanical comparators are made by the company with scales reading directly to 0.001 mm. (0.00004 in.), and are used for checking during the lapping operations, in conjunction with optical flats whereby the flatness of the surfaces is assessed.

Finished gauge blocks are passed into a measuring room in which the temperature is maintained at 20 deg. C. (68 deg. F.), and the moisture content of the air is held at a constant value throughout the year. Checking of gauge blocks for length, in this room, is performed on equipment designed for the purpose by Carl Zeiss, Jena, East Germany, and two different instruments are employed. The sorting of finished blocks into sets for workshop, inspection, or reference applications is performed with an instrument of the type shown in Fig. 8, of which six are installed. Measurement of length, or deviation from a master block, is read directly from a scale in this instrument, each division of the scale representing 0.0002 mm. (0.000008 in.).

The other instrument, employed for measuring the absolute length of class AA and master gauge blocks, is the interferometer shown in Fig. 9.



Fig. 9. For the measurement of the absolute length of class AA and master gauge blocks, this Zeiss interferometer is employed

Fig. 10. Only the largest of the range of three Tsugami thread-rolling machines is built at the Nagaoka works. This machine is rated at 25 tons, and has a capacity for work up to 4 in. diameter by 16 in. long

Monochromatic light is employed, and measurements can be made to an accuracy of 0.00001 mm. (0.0000004 in.). Other equipment employed for gauge block inspection includes a Taylor-Hobson Talysurf, surface-finish measuring instrument, and apparatus for checking the coefficients of expansion of samples. In addition to conventional parallel gauge blocks, the company also makes sets of wedge type blocks from which any required angle can be built up. About 40 workers are employed in the production of gauge blocks, and they make between 80 and 100 sets, each containing 103 blocks, per month.

Air conditioning is also applied to the standards room of the factory, which is well-equipped, and contains Société Genevoise linear and circular dividing machines of 1 metre and 500 mm. capacity, respectively. These machines are normally operated at night, when they are less affected by ground vibrations, and are used for the production of graduated scales both for the company's products and for supply to other firms in the industry. Société Genevoise measuring machines and Zeiss thread measuring machines are also installed, in addition to much equipment designed and made by the company.

TSUGAMI MACHINE TOOLS

The smaller thread-rolling machines, of 5 and 15 tons capacity, are built at the Shinshu plant, and the largest, of 25 tons, at the Nagaoka works. One of these large machines is seen under test in Fig. 10, where it is set up for rolling a worm thread of involute form with a pitch diameter of 48 mm. (1.889 in.), on a steel blank. The outside diameter of the worm is 56 mm. (2.2 in.), and it is 60 mm. (2.36 in.) long, with a thread depth of 8.628 mm. (0.339 in.). The thread has a pitch of 12.566 mm. (0.495 in.), which must be held to a tolerance of 0.03 mm. (0.0012 in.), and it is rolled in an automatic cycle. Including loading and unloading, the time required is 30 sec.



The work is held between centres for this set-up, the front centre being stationary (on the slide) and the rear being advanced by a cam at the beginning of the cycle. A roll speed of 24 r.p.m. is employed, and the moving roll, at the right, is advanced at the rate of 0.4 mm. (0.015 in.) per sec. The machine has a capacity for rolling threads on work up to 4 in. outside diameter, and up to 16 in. long, the maximum pitch being 0.5 in. and the maximum d.p., 6. Serrations up to 1/8 in. pitch can also be rolled, and the machine can be equipped, if required, with a set of three rolls to enable threads to be formed on thin-walled components and parts of unusual shapes. The roll speed can be varied in six steps from 24 to 72 r.p.m., and rolls up to 8 1/4 in. diameter can be employed.

A motor of 10 h.p. drives the rolls, and hydraulic power for the movement of the roll slide is provided by a pump driven by a 3-h.p. motor. The rolling pressure can be changed during the operation, if desired, so that the preliminary stage is completed at medium pressure, a higher pressure then being exerted as the full depth of the thread is reached. Equipment for automatic loading and unloading can be supplied, to operate in conjunction with the automatic cycle control.

PRECISION CYLINDRICAL GRINDING MACHINE

The type T-CGD-150 precision cylindrical grinder, shown in Fig. 11, is one of a pair of similar machines, the other being arranged for



Fig. 11. The type T-CGD-150, precision cylindrical grinder. A similar machine is built for internal grinding. Roundness of ground components, it is claimed, can be held within 0.00002 in.

internal grinding. This machine is designed for grinding parts such as valve plungers, needle rollers, and small tools and gauges, and has a capacity for diameters from $\frac{3}{8}$ to 1½ in., and lengths up to 5.9 in. under manual, and 3.16 in. under automatic control. The grinding wheel may have a maximum diameter of 4.5 in., and it is driven by a motor of $\frac{1}{2}$ h.p. at either 5,000 or 6,000 r.p.m. A movement of the wheel-head of 1.18 in. is available, and it can be swung through a maximum angle of 90 deg. in each direction.

Drive to the work-spindle is taken from a motor of $\frac{1}{4}$ h.p., and there is a choice of five speeds from 190 to 1,400 r.p.m. The table, which can be swivelled through an angle of 4.5 deg. on either side of the parallel position, is reciprocated either by hand or automatically. For the power traverse, a heart-shaped cam is employed, which engages with a nearly vertical lever, pivoted at one end. This lever moves the table, and the stroke and speed can be varied by adjusting the position at which a follower roller makes contact with the lever. The cam is driven from the work-spindle motor, through worm reduction gearing and 3-step pulleys.

Under suitable grinding conditions, it is claimed, roundness of components finished on this machine can be held within 0.0005 mm. (0.00002 in.), roughness within 0.0002 mm. (8 micro-inches), and parallelism within 0.001 mm. (0.00004 in.) over the maximum work length.

UNIVERSAL CYLINDRICAL GRINDING MACHINE

The type T-UGM universal cylindrical grinding machine shown in Fig. 12 has a capacity for workpieces up to 5.9 in. diameter by 13.75 in. long between centres. Grinding wheels up to 15½ in. diameter can be employed, and the wheel spindle is driven at either 1,500 or 1,800 r.p.m., by a 5-h.p. motor. The wheel-head slide has a feed traverse of 2.78 in., and the smallest increment of feed which can be applied is 0.00004 in. A pump driven by a 1-h.p. motor provides for the hydraulic traverse of the table, which can be reciprocated at steplessly-variable rates from 2 to 24 in. per min., over a distance of 17½ in. Feed increments can be applied at either or both ends of the table stroke, and there is provision for short stroke oscillation of the table, to improve the surface finish when plunge grinding operations are being carried out. Settings for automatic or hand



Fig. 12. This universal cylindrical grinding machine has a capacity for workpieces up to 5.9 in. diameter by 13.75 in. between centres. The hydraulically-operated table can be oscillated to provide improved finish when work is being ground by the plunge method

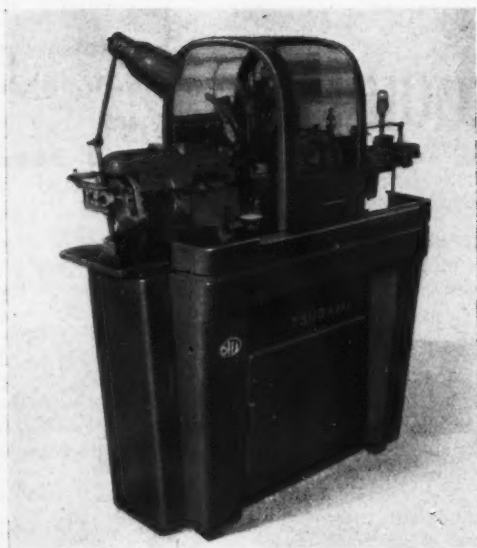


Fig. 13. More than 350 of these Swiss-type automatics have so far been supplied by the company to the Japanese watch- and clock-making industry

traverse, or plunge grinding, can be made with a selector switch at the front of the machine.

The work-head spindle speed can be steplessly varied by thyatron control of the 1-h.p. motor. When the machine is set for automatic operation, by means of a switch, the diameter of the work is controlled by means of equipment mounted on the table. This equipment selects the appropriate rate of feed depending on the amount of stock that remains to be removed, and finally stops the feed motion. A sparking-out period follows, and continues during a number of table strokes which can be set on a dial. When set for automatic cycle control, the machine is operated by a single lever. For internal grinding, an auxiliary wheel-head, with driving motor, is mounted on top of the main wheel-spindle housing.

TSUGAMI AUTOMATICS

The T-AS-T7, Swiss-type automatic shown in Fig. 13, is built in fairly large numbers, and some 350 of these machines have been supplied to the

Japanese watch- and clock-making industry since it was introduced. Bars up to 0.275 in. diameter can be employed, and the machine will turn parts up to 2.5 in. long. There are 20 spindle speeds, from 1,400 to 10,000 r.p.m., and the cycle time can be varied from 1 to 230 sec. Two larger sizes of automatics are also built, for bars of $\frac{3}{4}$ and 1 in. diameter, with spindle speeds of 200 to 6,000, and 45 to 3,000 r.p.m., respectively, which are designated types 00M and 2M.

As mentioned above, the company also builds Cri-Dan high-speed threading machines under licence, and both A and B types are made. The type A machine is supplied to camera manufacturers, for example, for cutting threads with as many as 40 starts on lens focusing components.

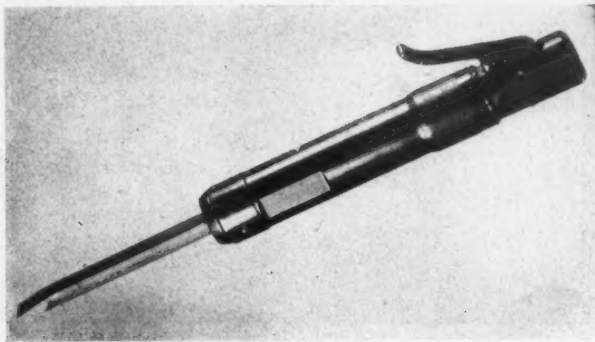
A further article in this series, to be published shortly, will be concerned with another Japanese machine tool factory.

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Consolidated Pneumatic Chipping and Scaling Hammer

The type CP-455-L chipping and scaling hammer shown in the figure has been introduced by the Consolidated Pneumatic Tool Co., Ltd., 232 Dawes Road, London, S.W.6, primarily for chipping weld flux, but is also suitable for use on stone, metal, concrete, and wood. A jet of air can be directed on to the work to blow away the chips.

With an air pressure of 90 lb. per sq. in., the piston, which has a stroke of 1 in., will deliver up to 4,200 blows per min., and a new design of "pulley valve" is employed to permit accurate control of speed and power by means of the lever-type throttle. Chisels are positively secured by a retaining device, and cannot turn. The tool weighs 4½ lb., and is 10½ in. long.



Consolidated Pneumatic chipping and scaling hammer

NEW PRODUCTION EQUIPMENT

Edited by

G. W. Mason
and

A. J. Barker

Monarch Series 80, Type 2516-20, Dyna-Shift Lathe, with Numerical Control

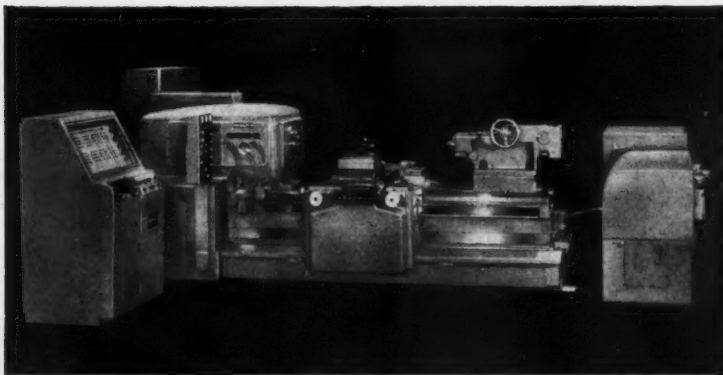
In connection with the exhibits at the Chicago Machine Tool Exposition last year, reference was made in MACHINERY, 97/898—19/10/60, to the series 80, type 2516-20, heavy-duty Dyna-Shift lathe, with Pathfinder numerical control for contour turning, which is built by Monarch Machine Tool Co., Sidney, Ohio, U.S.A. This machine will admit 72 in. between centres. Main drive is taken from a 25-h.p. variable-speed, constant-output motor, to which power is supplied by an electronic unit of the plug-in type, and the head-stock provides 36 spindle speeds from 10 to 1,250 r.p.m. Operating controls are mounted on a small panel on the saddle.

As seen in the accompanying figure, the Pathfinder equipment is housed in a separate cabinet, which requires a floor space of 3 ft. by 2 ft. 6 in., and there is provision for introducing operating data into the system manually. For automatic control, data are supplied by means of an 8-channel punched tape, and this tape also provides for indexing the turret, turning the coolant on and off, selecting the feed rate (which is steplessly variable up to 48 in. per min.) or the rapid

traverse of 175 in. per min., and selecting from a range of 18 spindle speeds within a 4:1 range. Looped or reeled tapes are accommodated by the reader, and data obtained are passed in serial form to a storage system, which enables an instruction to be read while the movements called for at the previous stage are being carried out on the lathe. On completion of these movements, the data forming the next instruction are transferred to an active register, whence they are passed to a director unit.

The circuit design of this electronic unit is similar to that employed in digital computers, and it provides a train of electrical pulses, each of which represents a 0.0001-in. increment of the required movement. This train is then converted, by the director unit, into a phase analogue signal, in the form of an alternating voltage which leads or lags in relation to a reference voltage by an amount proportional to the distance through which the slide is to be moved. The command signals are compared with those obtained from anti-backlash feed-back units for the saddle and the cross-slide, and voltage is generated to control the hydraulic servos which provide for the movements of the slides. The electronic units are completely transistorized, and plug-in modules are employed for ease of maintenance.

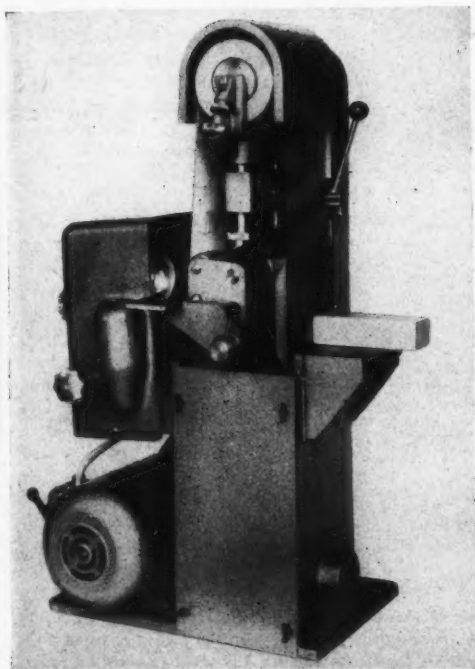
Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, London, N.W.2, are the British agents for the Monarch Machine Tool Co.



Monarch series 80, type 2516-20, Dyna-Shift lathe, with Pathfinder numerical control

Loeser Centreless Belt Grinding Machine

Shown in the accompanying illustration is the German-built Loeser centreless-type belt grinding machine which is handled in this country by the Addison Tool



Loeser type RS340 centreless belt grinding machine.
Vertical belt grinding operations on flat surfaces
can also be performed

Co., Ltd., 28 Marshalsea Road, London, S.E.1. Known as the type RS340, and designed for bench mounting, it has a capacity for cylindrical work from $\frac{1}{4}$ in. to 2 in. diameter. In addition, vertical belt grinding operations can be performed on flat surfaces.

The 6-ft. long by 6-in. wide belt is driven at a speed of 5,100 ft. per min. through V-belts from a reversible 3-h.p. motor mounted on the machine base, and all pulleys are carried in dust-proofed ball bearings. Narrower belts, down to 2 in. wide, can be fitted if required. Belt tensioning is effected by adjusting the upper pulley assembly, which has twin tubular guides and incorporates a spring-loading arrangement.

The angle of the feed wheel for centreless grinding can be adjusted to provide rates up to 82 ft. per min. Drive to the feed wheel is taken from the lower belt pulley spindle through worm gearing and a universal-jointed shaft. Alternatively, if desired, an independent drive, by geared motor, can be provided for the feed wheel. Pressure of the feed wheel on the work is applied by springs,

which can be interchanged to suit the type of work being handled and the finish required.

At the right-hand side of the machine there is a table measuring 4 in. by 5 in. to support workpieces on which flat surfaces are to be ground. A 4-in. diameter outlet is provided in the machine body, below the table, for connection to a dust collector unit. The weight of the machine is approximately 2½ cwt.

Beaver Milling Machine Developments

The Beaver type A vertical milling machine built by Balding Engineering Co., Ltd., Bessemer Road, Norwich, is shown in Fig. 1 fitted with Hepworth hydraulic copying equipment for controlling the movement of the table knee, to permit 3-dimensional shapes to be reproduced on the work from a master.

For copying, a maximum movement of 4 in. is imparted to the knee by a hydraulic cylinder mounted on the base, the piston rod of which is connected to the nut which meshes with the hand adjustment screw. When a locking nut has been released, the screw can be turned by means of a crank in the usual way for adjusting the knee for

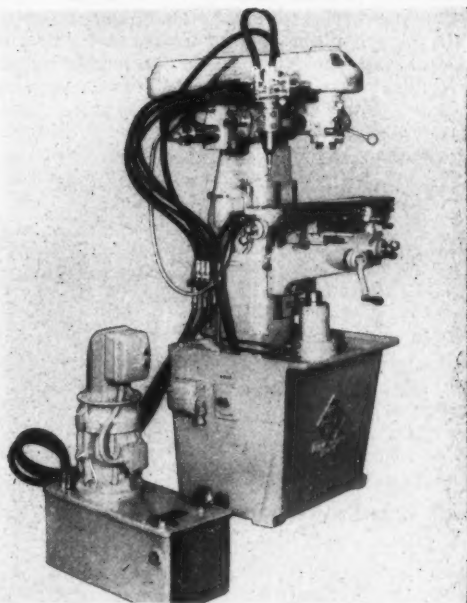


Fig. 1. The Beaver type A vertical milling machine is here shown fitted with hydraulic copying equipment

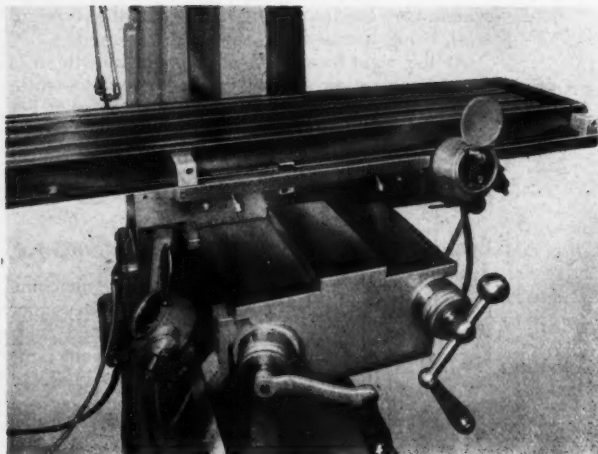


Fig. 2. Close-up view of the Beaver type VRBP vertical milling machine fitted with optical measuring equipment which provides for accurate setting of the machine table

a maximum distance of 13 in. The spindle head on the type A machine can be tilted, and swivelled in the horizontal plane on guideways on top of the column, and the 28- by 6-in. work-table has a longitudinal travel of 15 in. and a cross movement of 7½ in. Full details of the machine were given in *MACHINERY*, 92/1022—2/5/58.

Hydraulic copying equipment can also be supplied for the company's type VRBP swivelling turret, vertical milling machine. (95/777—14/10/59.) In addition, this machine can be fitted with scales and Hilger & Watts optical measuring equipment, as shown in Fig. 2, which enable accurate longitudinal and transverse table settings to be obtained, for jig boring operations. Alternatively, dial indicators and support pieces for length measuring bars can be provided.

SPW Type 1-04 Relief Grinding Attachment

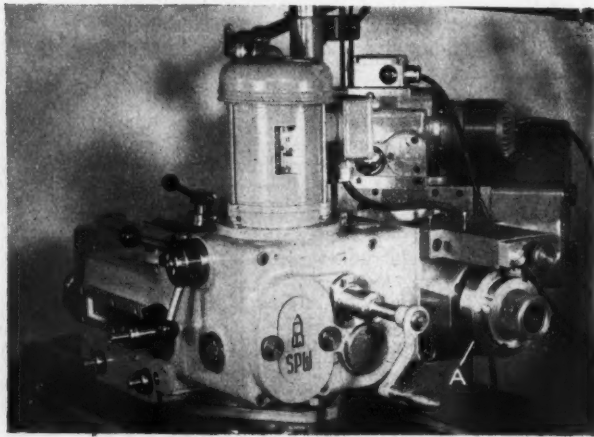
On the new type 1-04 relief grinding or backing-off attachment introduced by Süddeutsches Präzisionswerk, K.G., Germany, relief movements can be obtained in a direction parallel with, as well as at right-angles to, the headstock spindle. This

feature enables relief grinding to be carried out on twist drills and centre drills, for example, as well as on taps and dies, with numbers of flutes from 2 to 6. Relief movements up to ¼ in. can be obtained in an axial direction, by means of interchangeable cams, which can be mounted on the rear end of the headstock spindle as indicated at A in the figure. The amount of radial relief movement can be varied steplessly from 0 to ⅜ in.

Mounted on a swivel base so that it can be set for relief grinding of lead and point angles on taps and drills, the new attachment will handle work up to 4 in. diameter, and a maximum length of 12½ in. can be accommodated between centres mounted in the headstock spindle and the adjustable tailstock. Alternatively, the work can be held in a collet or a 3-jaw chuck, and the headstock spindle, which is bored 1½ in. diameter, will take a Morse taper sleeve. The spindle is driven by an f.h.p. motor,

and six work speeds ranging from 14 to 84 r.p.m. are obtainable. The spindle can be turned by hand to facilitate setting up, and the relief movements can be disengaged if required, for instance, if the attachment is mounted on a surface grinder, to enable cylindrical parts to be ground.

The company's attachment of basically similar design, which provides radial relief movements only, will continue to be made. SPW relief grind-



SPW type 1-04 relief grinding or backing-off attachment

ing attachments are distributed in this country by Urquhart Machine Tools, Ltd., 60 Tabernacle Street, Finsbury Square, London, E.C.2.

Ultra Adjustable Gauge Blocks

Known as "Ultra Quoins", the patented, German-made adjustable gauge blocks marketed in this country by Nonius, Ltd., 38 Beethoven Street, London, W.10, are supplied in pairs, as



A typical pair of Ultra adjustable gauge blocks

seen in the figure, and the abutting faces are inclined at equal angles to the parallel outer faces. The dimension across the latter faces is therefore altered when the blocks are adjusted lengthways, in relation to each other. Settings are made with reference to the graduations on the edge of the lower member, which are arranged to represent increments of either 0.00005 in. or 0.001 mm.

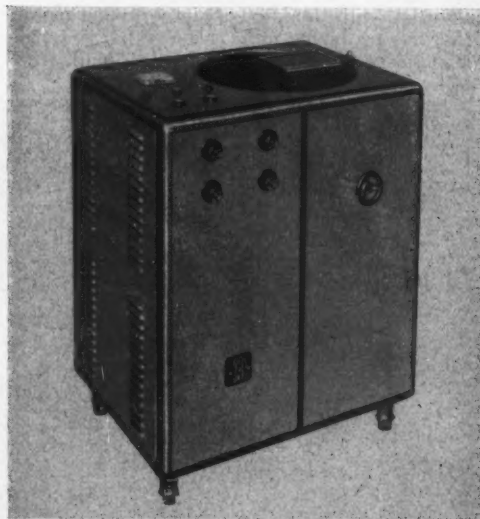
The blocks, which are intended for use with slip gauge sets, are $1\frac{1}{8}$ in. long, and are available in 5 sizes, with overall dimensions from $\frac{1}{4}$ to 2 in. or 5 to 50 mm. They are hardened, ground and lapped, and are made in accordance with DIN 861/I, which provides for a tolerance on a gauge size of 30 mm., for example, of ± 0.00035 mm. (0.000014 in.).

O.P. Hookercaster Type C.3 Centrifugal Casting Machine

In the accompanying figure is shown a general view of the O.P. Hookercaster type C.3 combined melting and centrifugal casting machine, which has been introduced recently by W. J. Hooker, Ltd., 239a Finchley Road, London, N.W.3. It is intended primarily for producing castings by the lost wax process, using the company's Investril investment moulding materials, and is capable of melting a wide range of metals.

The crucible and the mould are carried at one end of an arm, which is pivotally-mounted and has an adjustable counterbalance weight at the other end. Melting is performed by induction heating, and power at a frequency of approximately 1 mc. per sec. is supplied by a generator of new design, which has an output of about 2½ kW. The various motions during the operating cycle are controlled by means of three push-buttons and a handwheel, and after metal has been placed in the crucible, the induction coil is raised to surround the lower portion for melting. After completion of this stage, the coil is returned to the original position, and the arm is then rotated, for casting. In this way, delay between the two stages is reduced to a minimum, and it is stated that fine details can be reproduced and clean castings obtained, with good physical properties.

Drive for rotating the arm is taken from a 0.35-h.p. motor, and speeds of 450, 640, and 880 r.p.m. can be obtained. Interlocking is provided, to prevent engagement of the drive before the induction coil has been lowered, and an electronic braking system is incorporated, whereby the arm can be brought to rest either rapidly or slowly, as desired. To ensure quiet operation, the casting section of the machine is mounted on shock absorbers. Equipped with castors, the entire unit requires floor space of 2 ft. 7½ in. by 2 ft. 1 in., and weighs approximately 3 cwt.



O.P. Hookercaster type C.3 machine, for melting and centrifugally casting a wide range of metals

Russian IK62 8½-in. Centre Toolroom Lathe

AN IK62, 8½-IN. CENTRE, TOOLROOM LATHE, built in the U.S.S.R., has recently been installed at the Folly Hall, Huddersfield, works of Broomfield Engineering Co., Ltd., and is shown in Fig. 1 set up for drilling and boring the end of a spindle component. This lathe will take a maximum length of 56 in. between centres, and diameters up to 8½ in. can be swung over the cross-slide. It is also built with different bed lengths, which give capacities between centres of 28 and 39½ in.

Of box section, the 16-in. wide bed is heavily ribbed to ensure the rigidity necessary for taking heavy cuts at high spindle speeds and feeds, and has separate induction-hardened guideways for the saddle and tailstock. As an indication of the cutting capacity of the lathe, it is stated that during a test carried out by Broomfield Engineering Co., Ltd., a 1½-in. diameter mild steel bar was turned to a diameter of ¾ in. at a single pass with a tungsten carbide tipped tool, with a spindle speed of 1,000 r.p.m. and a feed of 0.006 in. per rev.

Drive is taken from a 13-h.p. motor housed in the base, through V-belts to the headstock, and thence to the spindle by a friction clutch and sliding gears. There are 24 forward speeds and 12 reverse speeds in the range from 12.5 to 2,000 r.p.m., which, in conjunction with the large-capacity driving motor, enable full advantage to be taken of tungsten carbide and ceramic-tipped cutting tools. Made from

chromium alloy steel and induction hardened, the headstock gears have shaved tooth flanks, and are chamfered at both ends to facilitate meshing. The splined shafts on which they are mounted run in ball bearings.

Spindle speeds are selected by means of two levers mounted on the headstock, a close-up view of which is given in Fig. 2. The lever at the end of the headstock is set with the aid of a chart to give the desired range of spindle speeds, and the speeds within that range are indicated by numbers which are observed through openings in the casting around the second lever. To bring the required headstock gears into mesh, the second lever is now turned until a pointer is positioned opposite the number which indicates the desired speed.

Mounted in adjustable roller bearings at the nose end, the headstock spindle is bored for the full length, and will take a No. 5 Morse taper shank. Push-buttons for starting and stopping the driving motor are mounted on the saddle, and reversing current is applied to bring the spindle quickly to rest. When the spindle has been stopped for a period of 20 sec., the driving motor stops. The electric control equipment, housed in a cabinet attached to the tailstock end of the bed, incorporates an ammeter for indicating the load on the motor when the lathe is in operation.

A quick change feed gearbox enables screw threads from 24 to 2 per inch, also metric threads from 1- to 192-mm. pitch, and pitches from 0.5 to 48 module and 96 to 1 d.p., to be cut. For high-accuracy threads, drive between the headstock and the leadscrew may be taken by change gears which serve to by-pass the feed gearbox.

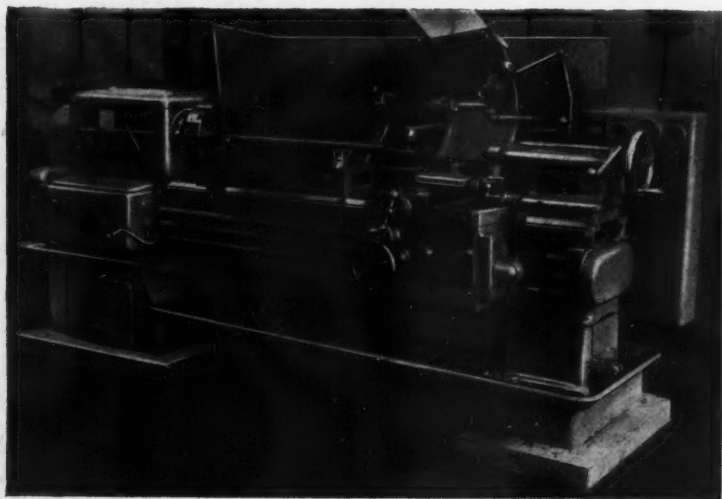


Fig. 1. This Russian IK62, 8½-in. centre, toolroom lathe is installed at the Huddersfield works of Broomfield Engineering Co., Ltd.

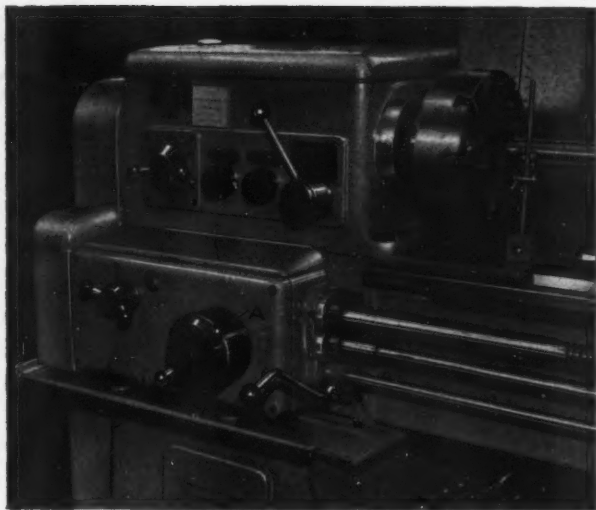


Fig. 2. Close-up view of the headstock and feed gearbox of the 1K62 lathe. Spindle speeds are selected by means of two levers, and there is a single drum for engaging different sliding and surfacing feeds within the ranges provided

A knob is mounted on the headstock, which is set in different positions for cutting right- or left-hand threads. In addition, there is a second, 3-position, knob which enables the ratio of the drive between the headstock and the feed gearbox to be increased for cutting screw threads with pitches either 8 or 32 times those normally obtainable, depending upon the spindle speed employed. When threads with different numbers of starts from 2 to 60 are to be cut, the spindle is stopped at the end of the return travel of the saddle after the cutting stroke. The second knob on the headstock is now brought to the central position, and the spindle can then be turned independently of the feed gearing for indexing. Settings for angle are made with the aid of an index plate mounted on the rear end of the spindle.

There are 42 sliding and surfacing feeds, the former ranging from 0.0027

to 0.163 in., and the latter from 0.0013 to 0.081 in. per spindle rev. Drive to the feed-shaft or the lead-screw is engaged by means of a lever on the feed gearbox, which actuates cams and links for bringing the required cluster gears into mesh. Different feeds and thread pitches, within the ranges provided, are selected by means of a single drum, which has a scale round the periphery. When a concentric disc fitted with four ball-ended handles is moved in a direction away from the feed gearbox to the full extent, the drum can be indexed to one of four positions. In this way, part of the scale which indicates the desired feed range, is brought uppermost. For selecting a particular feed within the range, the disc is moved axially to an intermediate position, and then turned independently of the drum to bring a pointer to the desired setting in relation to the scale. Finally, the disc is returned axially to its original position.



Fig. 3. In this close-up view of the saddle and tailstock may be seen the single joy-stick lever which provides directional control for the sliding and surfacing motions. For rapid power traverse, the feed shaft is belt driven from a motor at the tailstock end of the bed

From the feed shaft, sliding and surfacing motions in either direction are transmitted by four fine-tooth clutches built into the apron, which are engaged, as required, by a single joy-stick lever mounted on the right-hand end of the saddle, as may be seen in the close-up view Fig. 3. Depression of a push-button built into the end of this lever starts a motor at the tailstock end of the bed, which drives the feed shaft at high speed through a V-belt, for imparting rapid power traverse to the saddle and cross-slide at the rate of 134 in. per min. When rapid power traverse is engaged, the feed shaft is disconnected from the feed gearing by an over-running clutch.

A claw-type safety clutch, built into the apron, is disengaged to stop the feed when a pre-determined cutting force is applied. Stops can be attached to the bed for automatically tripping the sliding feed to facilitate turning parts to pre-set lengths. On the front of the apron there is a drum-type scale which gives readings to 0.05 in., and is rotated when turning is in progress to indicate the traverse movement of the saddle. The cross-slide carries a swivel top slide and a 4-way toolpost, and the traverse screw engages with a nut of split design which can be adjusted for eliminating backlash.

The substantial tailstock body can be set over on the base for taper turning, and the large-diameter hardened steel barrel, which is bored No. 5 Morse taper, has an axial travel of 8 in. by hand. If required, the tailstock can be connected to the saddle to provide power feed for drilling. For this purpose, the saddle is brought close to the tailstock and the cross-slide is adjusted to bring an L-shaped steel plate into engagement with a mating plate of similar shape attached to the base of the tailstock. A lever-operated clamp at the rear end of the tailstock is then partly tightened to hold the base in close contact with the bed-ways while drilling is in progress. When the work is to be supported by the tailstock centre, or drilling is to be carried out by hand, the tailstock is secured to the bed-ways by clamps which are tightened by means of bolts.

The headstock and feed gearbox are lubricated by separate plunger-type pumps, and a third pump, of similar design, delivers lubricant to the apron gearing and the bed and cross-slide guide-ways. Coolant equipment is provided, and hydraulic copying equipment and a taper turning attachment are available. The lathe here described was supplied by Machine Tool Agencies, Ltd., 77 Portland Place, London, W.1.

Hahn & Kolb Demonstration

Variomatic, Escomatic and Tornomat machines handled in this country by Hahn & Kolb (Great Britain), Ltd., 243-245 Horn Lane, Acton, London, W.3, were demonstrated recently at the Engineering Centre, Stephenson Place, Birmingham, 2.

Terminal components for electrical equipment were produced at the rate of 26 per min. from 10 mm. (0.393 in.) diameter brass wire in coil form, on the latest Variomatic type T3 C rotary transfer machine, which incorporates an improved camshaft drive arrangement, and was fitted with heads of new design for turning and milling. Variomatic machines are being employed on an increasing scale for the quantity production of electrical and instrument components, and particulars of various set-ups have already been given in MACHINERY, 93/815—8/10/58 and 95/1175—2/12/59. A maximum of 14 spindle heads may be grouped round the central indexing table for the work-holding fixtures, and feed and rapid traverse movements are derived from four camshafts. Whereas on the earlier machine the camshafts were connected to each other by bevel gears, with the latest design, drive from a centrally-mounted gearbox is taken to each shaft by bevel gearing and a worm and wormwheel.

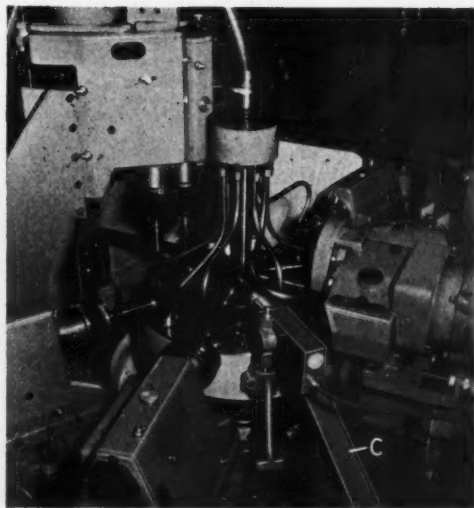


Fig. 1. Close-up view of the Hahn & Kolb Variomatic indexing machine set up for producing a terminal component from $\frac{1}{4}$ -in. diameter brass wire

With this arrangement, the ends of the camshafts are unobstructed, and changing of cams is facilitated. Drive is taken from one of the camshafts to an auxiliary shaft which controls the indexing motion of the table.

Fig. 1 gives a close-up view of the machine as set up for the recent demonstration, and the component, and the series of operations carried out, are shown diagrammatically in Fig. 2. The wire from which the component is made is of the largest diameter yet handled on the machine, and is drawn from the coil and passed through a roll-type straightening unit attached to the base of a motor-driven swivel sawing head at station (1). The sawing head is indicated at A in Fig. 3, which is a close-up view of the machine from the opposite side to that seen in Fig. 1, and also shows the straightening rolls. Cam-operated jaws on a feed slide grip the work material and advance it through a guide bush and between a pair of gripper jaws on one of the fixtures on the table. When the slide has been advanced to the full extent, the end of the work material makes contact with a stop, whereupon the jaws on the fixture are closed and the sawing head is swung downwards to cut off a piece of sufficient length for one component. The sawing head is now swung clear and the feed slide is returned to its original position. At the beginning of this stage, the first pair of gripper jaws is opened to release the wire, which is prevented from moving with the feed slide, during the return travel, by pressure applied by a pair of rollers.

Next, the table is indexed in an anti-clockwise direction, as viewed from above, and at station (2) the off-set 0.250 and 0.3125-in. diameters are turned by pre-set cutters mounted in the newly-designed head, B, Fig. 3. Simultaneously, a chamfer is cut at the end of the smaller diameter portion, and the part is centre drilled. For this operation, the cutter spindle is run at a speed of 6,600 r.p.m., and a feed of 0.004 in. per rev. is employed. The turning and chamfering tools are mounted on separate carriers which can be adjusted radially on a faceplate attached to the spindle nose. This arrangement enables each carrier and cutter assembly to be removed from the faceplate as a single unit, when it is required to sharpen the cutting edges.

At the third working station, a standard-type Variomatic motor-driven spindle unit is employed for drilling the 0.187/0.189-in. diameter hole in the component, a spindle speed of 6,460 r.p.m. and a feed of 0.005 in. per rev. being employed for this operation. When the table has been indexed to bring the workpiece to station (4), a pair of flats is straddle milled by cutters mounted

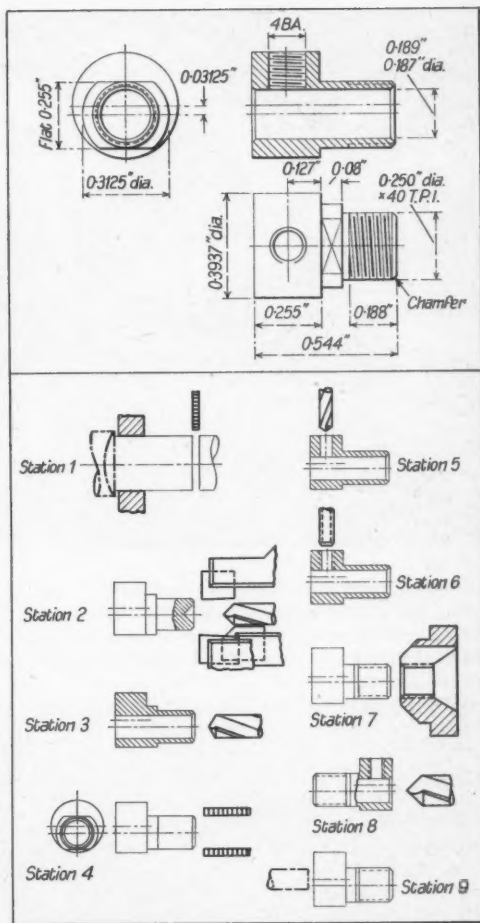


Fig. 2. Diagrammatic layout of the sequence of operations performed on the Variomatic machine shown in Fig. 1

on the new milling head. The cross hole in the enlarged diameter end of the piece is drilled at station (5), and tapped 4 B.A. at station (6), by a pair of vertically-mounted spindle heads, and at the seventh station, the 0.250-in. diameter by 40 t.p.i. thread is cut by a button die. The spindle heads employed for tapping and threading are of similar design to those used for drilling, except that each is provided with a micro-switch, operated by an adjustable stop, for automatically reversing the driving motor at the end of the cutting stroke.

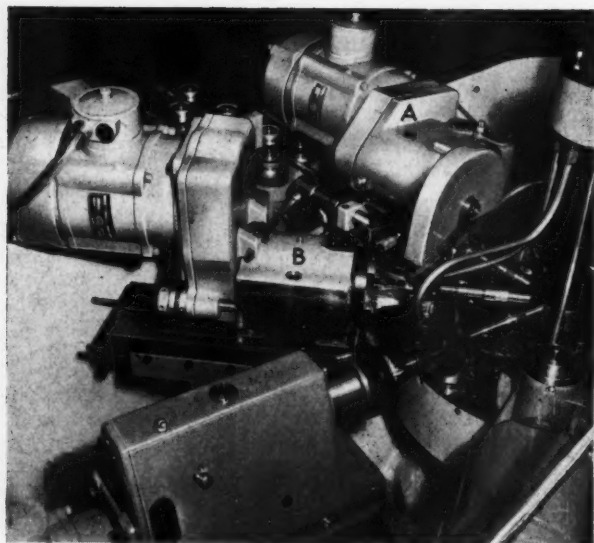


Fig. 3. The recently-introduced turning head for the Variomatic machine is shown at B in this close-up view

During the next indexing movement of the table, the fixture is turned through 180 deg. by a pinion and gear segment, and at station (8) the bore at the larger diameter end of the piece is chamfered by a twist drill. The fixture is again turned through 180 deg. during the following indexing movement, and at station (9) the gripper jaws are opened, and the completed part is ejected by a cam-operated plunger, to be discharged from the machine by way of the inclined chute C, Fig. 1.

Automatics in the Escomatic range are intended for the high-speed production of components from wire stock in coil form, and a large number of pieces is obtained before it is necessary to replenish the stock supply. Turning and parting-off operations are carried out by cam-operated swing-type cutters mounted on the rotating tool-head. The work material, which does not rotate, is supported by a bush in the tool-head, also by a counter-collet in front of the tools, to enable components to be parted off without pips or burrs.

Three machines from the Escomatic range were demonstrated, namely, the types DS 2, D 4, and D 6 R. The types DS 2 and D 4 automatics have capacity for wire up to $\frac{1}{2}$ in. diameter, and on each machine the tool-head carries two cutting bits. On the type D 4, there is a 3-station end-working attachment, which has two driven spindles to provide for drilling and similar operations, and a counter-collet to support the work during parting-off. The entire end-working attachment, with the built-in Geneva-type indexing mechanism, is

mounted on a pivoted arm, and can be swung upwards so that it is brought clear of the tool-head to afford access for setting the cutting bits. A microscope attachment is then fastened to the tool-head to facilitate setting. In the close-up view in Fig. 4, the tool-head is indicated at D, and the end-working attachment is shown in the raised position at E.

On the Type D 6 R $\frac{3}{4}$ -in. capacity machine, which was described in MACHINERY, 96/1078—11/5/60, the entire headstock and tool-head assembly, can be moved transversely by handwheel, in a direction towards the operator, to bring it clear of the 4-station end-working attachment, when the cutting tools are to be set. During the final part of this movement, the headstock is connected to an auxiliary camshaft, which can be rotated by means of the same handwheel for operating the tools, as required for setting up.

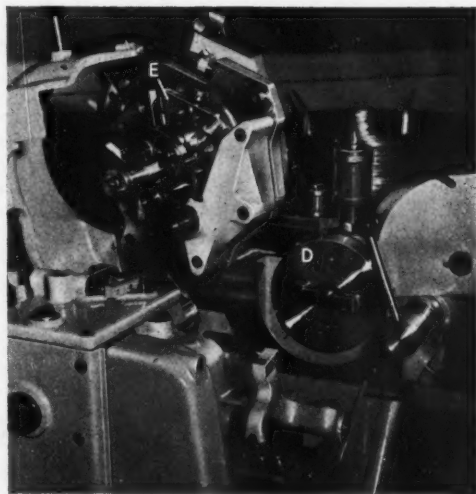


Fig. 4. Close-up view of the Escomatic type DS 4 machine with the end-working attachment E in the raised position to give access to the tool-head

Developments at the Works of Hills Precision Die Castings, Ltd.

An extension, recently brought into use at the Cateswell Road, Hall Green, Birmingham, 11, works of Hills Precision Die Castings, Ltd., has added some 17,000 sq. ft. of floor space to the premises, which formerly covered 44,200 sq. ft., inclusive of offices. New buildings, which were built at a cost of about £70,000, have augmented the previous factory area of 39,000 sq. ft. by approximately 8,000 sq. ft., and the additional space has enabled various departments to be re-arranged for more efficient operation.

Casting of zinc and aluminium alloys is performed in two separate shops, and lead castings are made at another small works about 3 miles away, to avoid any possibilities of contamination. The zinc foundry is equipped with three small Madison-Kipp, two E.M.B., and seven Schultz hot-chamber machines, and has an unusual layout, part of which is shown in Fig. 1, where two of the Schultz machines may be seen. Opposite the operator's position at each machine there is a Bipel platen type clipping press, and between each die casting machine and the associated press a water quench tank is provided.

Sprays of castings taken from the machine are cooled by quenching and then placed in the clipping tool. When the press is operated they are pushed through the die and fall on to a continuously-running conveyor belt beneath, as seen in the foreground in Fig. 1. Overflows, flash, and runners are swept by the operator on to another conveyor belt at the rear of the press, leading to a hopper at the furnace end of the die casting machine. The hopper is arranged to be tipped by an air cylinder which is ener-

gized at each machine cycle, and the scrap is thus continuously returned to the furnace of the machine for remelting.

Where required, machines such as drills, back-stand polishers, and grinders are installed alongside the conveyor which carries the clipped components from the press so that a series of operations can be completed on the castings before they are packed into boxes to travel to the finishing shops. The special-purpose, 3-station, indexing-table machine in the right foreground in Fig. 1, for example, is employed for drilling and tapping five holes in the motor car trim component which is here in production.

A feature of the company's die casting operations is the use of unit dies, which are made in three sizes measuring 7 by 7, 7 by 9½ and 14 by 14 in. Bolsters for the two smaller sizes each accommodate four, and those for the largest, two dies. An example of the use of such dies, which offer important economies for the customer, is illus-



Fig. 1. This view in the zinc factory shows the arrangement of die casting machines, trimming presses and conveyors for castings. Scrap material from the presses is returned to the melting pots by conveyors

trated in Fig. 2, where a spray comprising castings of four different forms is seen being removed from a Schultz machine. The unit principle is also applied to dies used in the clipping presses.

In the smaller aluminium foundry there are three Herbert Reed-Prentice 1½G cold-chamber machines which produce castings from No. 2, 6 and 24, of the LM series of alloys. The foundries together have a floor area of some 8,500 sq. ft., and occupy adjacent areas at one side of the building. All the machines operate on semi- or fully-automatic cycles, and are connected to a Centralograph installation on which a continuous record of performance is maintained.

From the conveyors mentioned, the castings are transferred in boxes or trays to a work bank area between the foundries and the machining, plating, and polishing shops. The provision of this work bank enables the company to make components in economical quantities, even when customers' requirements are for regular deliveries of small batches. Such small batches of castings

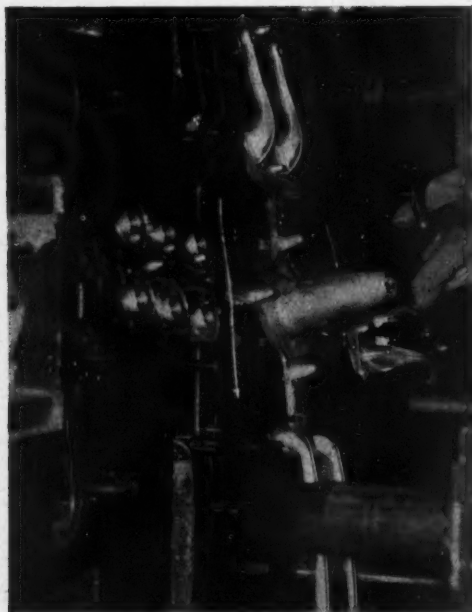


Fig. 2. Unit dies of three different sizes are employed for certain components to reduce production costs and ensure more efficient utilization of the machines. Here, a spray comprising four different castings is being removed from a unit die on a Schultz machine



Fig. 3. Threaded studs are screwed into untapped holes in castings which require such inserts, by means of this modified tapping machine, thus avoiding the handling problems associated with the use of loose inserts in casting dies

can be withdrawn from the bank, as required, and subjected to any necessary further processing before delivery.

In the machine shop, extensive use is made of nest-type fixtures made by gravity casting plastics materials, for holding castings of complicated shapes during drilling and other operations. An interesting production method, where stud type inserts are required in a casting, avoids the need for placing inserts in the die. Instead, the casting is made with a cored hole slightly smaller than the diameter of the threaded insert, and the latter is screwed into this unthreaded hole on a normal tapping machine, as indicated in Fig. 3. Here, a boot lid hinge member, in which two studs must be inserted, is placed in the nest type plastics fixture, which can slide longitudinally between guides.

A stud is hand-loaded between two spring fingers on a slide at the rear, which can be advanced by an air cylinder. The stud is thus carried to a position directly beneath the spindle of the tapper. This spindle carries a plain threaded bush, and when the machine cycle is started, this bush is screwed down on to the stud which has been advanced to the correct position. Stops on

the fixture ensure that the casting is held with one of the insert holes beneath the spindle axis at each end of the slide movement.

After the bush has been screwed on to the upper end of the stud, the finger slide is retracted. Further downward movement of the spindle then screws the stud into the un-tapped hole in the casting, in which it is sufficiently tight to be retained when the tapping attachment is reversed at the end of its travel.

Other departments, which provide for vacuum metallizing, painting, assembly, packing and despatch, tool-making, die and tool storage, barrelling, and the making and repairing of plating jigs, also offices, are conveniently arranged round the periphery of the building, and other office accommodation is provided in the extension.

We hope to make further reference to the activities of the company in a more detailed article at a later date.

Kodak Safety Exhibition

An exhibition was staged recently at Kodak Hall, Wealdstone, Middlesex, to draw attention to the importance of accident prevention in the home, at work and on the roads, and the exhibits were arranged in groups, each concerned with a particular field. In the section devoted to the installation and handling of electrical equipment were shown defective portable tools, and incorrect wiring and potentially-dangerous switch installations. Demonstrations were held at frequent intervals throughout the exhibition to draw attention to the risk of explosions through careless handling of petrol and other volatile liquids, also to the explosive nature of mixtures of dust and air in confined spaces. Emphasis was laid on the safe handling of awkward loads, and numerous diagrams were displayed which showed ways of avoiding muscular injuries when lifting and carrying.

One display stand was concerned with the training course given by Kodak, Ltd., to their own employees who operate mechanical handling equipment, and particular reference was made to the correct use of fork-lift trucks. This stand and an adjacent display relating to safety precautions applicable to lifts and cranes are shown in the accompanying illustration.

Among other aspects of safety at work, to which attention was directed on different stands, were avoidance of eye injuries by the use of protective goggles and

prevention of burns by the wearing of correctly-designed clothing; guarding of machine tools; provision of ladders and crawling boards for reaching and traversing fragile roof structures as, for example, those made of corrugated asbestos sheeting; suppression of unnecessary noise produced by pneumatic equipment, including road drills and air-operated tools and attachments for machine tools; rapid detection of noxious vapours; and precautionary measures necessary when handling radio-active isotopes and other emissive materials.

Kodak, Ltd., who arranged the exhibition, have a safety department, with three safety officers and two training officers. A fully equipped medical centre is maintained for the benefit of the firm's 6,000 employees, and is staffed by three doctors and seven nurses.



Two of the stands at the Safety Exhibition organized by Kodak, Ltd.

NEWS OF THE INDUSTRY

The South

PETBOW, LTD., Sandwich, Kent, inform us that their turnover for 1960 was exceptional and that the value of orders received during the period was a record for the company. Demand for engine-driven power plant, for welding and generating equipment, mobile workshops, and flood-lighting installations continues to expand, and to provide for increased production, the firm has embarked on an expansion programme which will involve the erection, on the 75-acre site at Sandwich, of a new

office building, a sheet metal shop and a large test house in which equipment can be subjected to arctic, tropic, and other conditions.

A new welding machine and a range of marine auxiliary and emergency generating sets have recently been introduced, the latter being powered by Rolls-Royce oil engines. It may be noted that the company is able to provide transportable skid-mounted power stations, with built-in workshop equipment if required, up to an overall weight of 60 tons.

PERFECT DIE SINKING CO., LTD., Margate Road, Broadstairs, Kent, are now well established in their modern premises to which they transferred their entire facilities from Ramsgate last year. The skilled employees number approximately 40—mainly toolmakers—and the principal activity is the production of moulds for the plastics industry. Tool-making work is also undertaken for the trade. Equipment installed in the shops includes a Bridgeport milling machine with a Tru-Trace copying attachment and a pantograph machine by Geo. H. Alexander Machinery, Ltd.

VIKING INDUSTRIAL PLASTICS, LTD., Margate Road, Broadstairs, are well occupied with a wide variety of industrial mouldings in polythene, melamine, nylon, and various styrenes. For injection moulding, 28 machines by Windsor, PECO, and Reed-Prentice are installed, the largest of which

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More than 30 executives of member companies of The British Power Press Manufacturers Association, Standbrook House, Old Bond Street, London, W.1, recently visited the works of Joseph Rhodes & Sons, Ltd., at Wakefield, Yorks., also the adjoining works of the associated company, Slater & Crabtree, Ltd. Such inter-factory visits, it may be noted, are arranged periodically among member firms. In the photograph, Mr. Henry D. Challen, chairman of the Association, is in the centre of the front row, with Mr. W. Stanley Rhodes (chairman of Joseph Rhodes & Sons, Ltd., and a member of the Council of the Association) on his left, and Mr. C. E. Rockwell (managing director of Rockwell Machine Tool Co., Ltd., and a member of the Council) on his right. Next to Mr. Rockwell is Mr. E. C. Seed, chief engineer and sales manager of Cowlishaw, Walker & Co., Ltd., vice-chairman of the Association



has a shot capacity of 16 oz. Twelve compression moulding machines, by Bradley & Turton and other makers, are also in use.

BIRCHINGTON ENGINEERING CO., LTD., Albion Road, Birchington, Kent, who specialize in the production of cold drawn sections of various shapes, in a wide range of non-ferrous and ferrous materials, are exceptionally busy. Such sections are supplied to manufacturers of calculating machines, optical instruments, meters, dial gauges, and vehicle components, for example, for conversion to finished parts by parting-off to the required lengths.

Drawing techniques have been improved during the period since the company started operations in this field in 1946, and it is stated that much of the work undertaken at present is concerned with sections in high tensile steels to close tolerances. Hollow sections in light alloy are frequently produced and many are supplied with highly finished bore surfaces.

There is a good call for the miniature geared motor units which this company produces, with speed reductions of 10:1 or more, for operation on 4½ to 6 volts.

PLENTY & SON, LTD., Eagle Ironworks, Newbury, Berks., have been actively engaged in engineering since 1790 and were originally noted for plough-shares of exceptional quality for the period in which they were produced. Other mechanical devices were introduced at frequent intervals, and by 1863 the company had become well known for a variety of products, including steam engines. Later in the century, this firm designed and built the machinery for the twin-screwed submarines invented by Nordenfeldt, and with increasing activity in ballooning for scientific investigations, provided gas boosters for filling the envelopes. Early in this century Plenty designed and built a number of delivery vehicles fitted with petrol engines, and later introduced a wide range of rotary pumps for handling paint, fuel oils, lubricants, and chemicals, for example. More recently the scope of the company's activities has been widened to include the design and manufacture of mixing machines and filters for laboratory and industrial applications. This side of the business continues to expand, and we are informed that there is a very good demand for such equipment from world markets.

ADDY PRODUCTS, LTD., Millbrook Trading Estate, Southampton, report that the sales of Addyco punched and notched metal strip are well maintained and that the demand for standardized jig parts is satisfactory. Due to the general increase in the level of business, the company has decided to extend the premises during the coming year to

provide an additional 2,800 sq. ft. of space, part of which will be used for a drawing office.

SKINNERS (SOUTHAMPTON), LTD., Millbrook Trading Estate, Southampton, are occupied with the design and production of a wide variety of jigs, fixtures and press tools, also with contract work involving the production of machined parts, in small and medium batches, for a number of companies. The facilities available for prototype work, which may require jig boring operations, are frequently in demand.

F. W. HERRIDGE.

Safety Footwear

In 1959, there were some 37,200 reported industrial accidents involving injuries to the feet and ankles and, as has been pointed out by the Chief Inspector of Factories, many of these injuries could have been prevented by the use of safety footwear.

The term, "safety footwear," is usually applied to boots and shoes which incorporate internal steel toe caps, and comply with a British Standard Specification. Statistics indicate that approximately 60 per cent of all foot fractures involve the toes, and steel toe caps are claimed to give protection to 16 of the 27 bones in the foot. International Safety Products, Ltd., Rushden, Northants., sell more than 1-million pairs of caps per year to shoe makers in this country and abroad. The company in conjunction with their associates, Protective Service Footwear, Ltd., Kingswood, Bristol, also manufacture safety footwear.

Lecture on Cold Forging

At a recent members' meeting of the London Association of Engineers, a lecture on the economic aspects of cold forging was delivered by Mr. F. Griffiths, chief production development engineer, British Motor Corporation. This lecture was based on a paper he had earlier presented at a convention in Prague, Czechoslovakia, for which he was awarded a gold medal in recognition of an outstanding contribution to metal working knowledge in this field. In it, he re-emphasized many of the main points from the paper which he read at the Sheffield conference on the cold extrusion of steel, held by the Institute of Sheet Metal Engineering towards the end of last year. An abstract of this paper was published in **MACHINERY**, 97/1315—7/12/60.

The main theme of Mr. Griffiths' L.A.E. lecture was that the cold extrusion of steel, even at the present state of development, was a fully workable process, which could be operated effectively with existing tool-materials. Tooling costs, he

pointed out, were approximately the same as for equivalent hot forging dies, plus the cost of polishing, and a "visual" polish, in which scratch-marks were not visible to the naked eye, would suffice. Under favourable conditions, cold extrusion tools had a useful life up to 10 times that of corre-

sponding hot forging dies, and in an organization with as large a production turnover as that of B.M.C., the economies that could be effected through the elimination of bulk metal-removal processes could be very substantial.

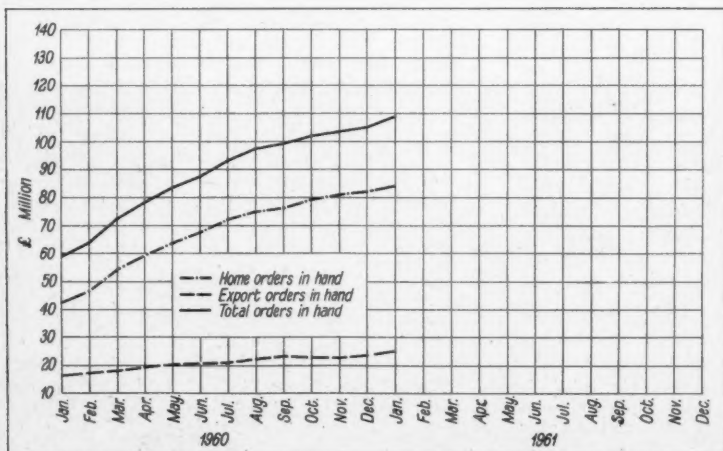
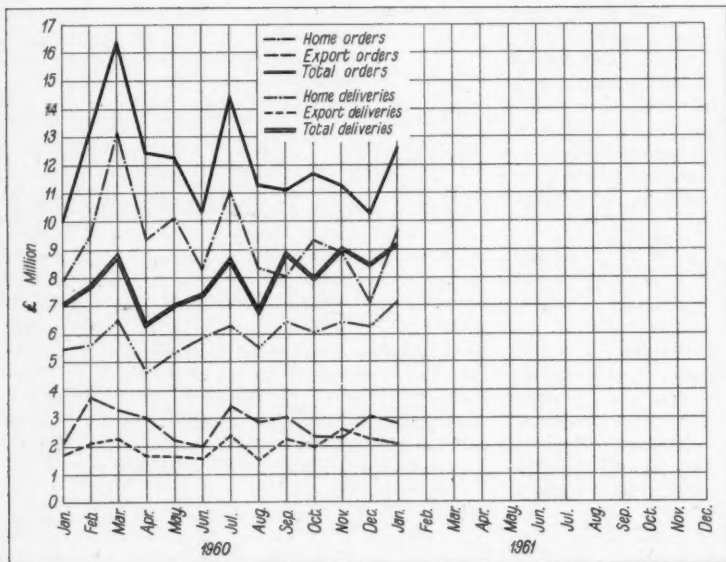
For these economies to be realized in practice,

however, it was essential to devote the closest attention to reductions in the capital cost of basic equipment, both for the billet-preparation and cold extrusion stages of manufacture.

The initial outlay necessary for suitable conventional hydraulic presses, for example, was such that the potential economies offered by the process would have been largely dissipated in amortization costs. For this situation to be avoided, simple "basic" hydraulic presses, devoid of all special refinements and elaborations were required. As a result of B.M.C. insistence on this point, and collaboration by the press manufacturers, suitable simplified machines had been built, the capital cost of which was approximately one-sixth that of conventional machines. Other users of the process, potential or existing, were now in a position to take advantage of this development, since presses of this simplified design were available to all.

In connection with billet-preparation, Mr. Griffiths mentioned that it had been found necessary, at B.M.C., to machine the external diameters, as well as the ends of the billets, to remove surface defects from the bar stock. In general, billet-prepara-

Curves showing the monthly values of machine tool orders and deliveries to the home and export markets, also values of orders in hand



tion demanded closer attention than the actual cold extrusion process, and much work still remained to be carried out on preforms for cold forging irregular shapes. So far as billet lubrication was concerned, there appeared to be some possibility of the eventual elimination of the phosphating treatment. For example, for one of the cold extrusions produced at B.M.C., the only pre-treatment of the billets comprised barrelling in molybdenum disulphide. (See also MACHINERY, 97/995—2/11/60.)

E.M.I. Electronics New Showroom

A representative display of the electronic equipment made by E.M.I. Electronics, Ltd., can be seen in the company's recently-opened showroom at E.M.I. House, Manchester Square, London, W.1.

The range of products on view includes the E.M.I. fully-automatic electronically-controlled commutator slotting machine, which was described in detail in MACHINERY, 98/483—3/1/61, in an article on the production of Hoover f.h.p. electric motors. Three of these machines are in use at the Hoover works. They are tended by one operator and enable commutators to be slotted at the rate of 153 per hour.

An Emidec 1100 computer has been installed in the showroom and is separated from the other exhibits by glass walling. Normally, the computer will be used to operate a fully-integrated data processing system for E.M.I. Records, Ltd. It will, however, also be employed for testing programmes that have been prepared for use on other computers which are being built for customers, and for training members of customers' staffs. In addition, arrangements can be made for firms which only occasionally have need of electronic data processing facilities to make use of the machine.

Also displayed at Manchester Square are nuclear health instruments; closed-circuit television equipment for black and white, and colour transmissions; stroboscopes; oscilloscopes; and dynamic balancing machines.

Commonwealth Technical Training Week

(Continued from page 1103)

absorbing interest in an era of technical advance without parallel in human history.

If, then, Commonwealth Technical Training Week has the effect of directing large numbers of young people along these paths, it will prove to have been of incalculable value in assisting populations to raise living standards, which are often so deplorably and unnecessarily low.

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For many years MACHINERY has provided an enquiry service not only for subscribers and advertisers but for all engineers in need of such information as the names of makers—or their agents—of machines or equipment for performing particular operations, suppliers of various classes of material, firms with facilities for undertaking certain types of work, owners of trade names, and agents for foreign machine builders. If you have such a problem write (MACHINERY, Enquiry Bureau, Clifton House, 83-117 Euston Road, London, N.W.1) or telephone (Euston 8441, 2 lines). This service is, of course, entirely free.

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Industrial Notes

G. ZWICKY (LONDON), LTD.—The address of this company is now Zwicky House, 241-247 High Street, Acton, London, W.3 (telephone, Acorn 6011).

E.M.B. Co., LTD., inform us that the address of their London area office is now c/o Mr. P. N. Jay, 168 Park Street Lane, Park Street, St. Albans, Herts.

COMMUNICATION IN INDUSTRY AND COMMERCE will be the subject of a one-day conference to be held on May 25 at the Connaught Rooms, London, W.C.2, by the British Institute of Management, 80 Fetter Lane, London, E.C.4.

SOAG MACHINE TOOLS, LTD., Juxon Street, Lambeth, London, S.E.11, will show a representative selection of clutches and geared drives from the Ortlinghaus range at the Building and Public Works Exhibition to be held at Castle Bromwich, Birmingham, from June 14 to 21.

AN AUCTION SALE OF MACHINE TOOLS and miscellaneous stores from the Technical Stores Depot, Old Dalby, Leics., will be held at Melton Mowbray on June 7. The auctioneers will be Shouler & Son (Dept. L), 1 Norman Street, Melton Mowbray, Leics.

SILKY & Co., Morley, Nr. Leeds, have introduced Silky, a non-abrasive cream for the removal of dirt and grease from engineering plant, walls, windows, and lighting fittings. It contains no caustic or bleach, and one gallon is stated to be sufficient to clean several hundred square yards of paintwork, for example.

MANAGEMENT CONSULTANTS ASSOCIATION, 4 London Wall Buildings, London, E.C.2, have issued a booklet entitled "Marketing and Selling," which draws attention to the factors involved in planning and promoting sales both at home and abroad. Copies are obtainable free from the above address.

NEW B.M.C. ASSEMBLY BUILDING.—The No. 2 car assembly building now under construction at the Longbridge Works of the Austin Motor Co., Ltd., Birmingham, for the production of the Austin Seven and Morris Mini-Minor, will have a capacity for 2,500 vehicles per week. It will involve a total expenditure of £3½ million, and is expected to be in production early next year.

VACTRIC (CONTROL EQUIPMENT), LTD., and **VACTRIC (PRECISION TOOLS), LTD.**—It is announced that The News of the World Organization, Ltd., 30 Bouverie Street, London, E.C.4, has agreed to purchase the whole of the issued share capital of these companies from the Receiver of Vactric, Ltd., in liquidation. The management of the two companies will remain unchanged.

GUEST, KEEN & NETTLEFOLDS (MIDLANDS), LTD., Screw Division, Box. 24, Heath Street, Birmingham 18, are to open the G.K.N. Technical Centre on May 26. The centre will provide for the training of their own and customers' staffs, and will house displays of screws, nuts, bolts and other fastenings made by the G.K.N. Screw Division, together with exhibits showing typical applications, also various means of driving screws.

TECALEMIT, LTD., Plymouth, Devon, are to build a factory on a 15-acre site at Pool, Camborne, Cornwall. The first building, of about 30,000 sq. ft., with the necessary services, is expected to be fully operative within a year, and will give employment to 250 people. Ample room for expansion is available on the site, and a pilot plant is to be opened immediately at other premises in Camborne.

DAVY AND UNITED INSTRUMENTS LIMITED, Sheffield, have received from Stankoinport, Moscow, an order, valued at more than £90,000, for eight transmission gamma ray thickness gauges for installation in Russian steel mills. One gauge will be used for measurement of hot steel plate from 3.75 to 50 mm. thick and another for hot rolled strip from 1.5 to 12.5 mm. thick. The remaining six will be used in connection with cold strip mills.

DEWRANCE CO., LTD., 165 Great Dover Street, London, S.E.1, have formed a Metals Division comprising the foundry at Hillington, and the Special Alloys Division in London. This new division, which will have its own board of management, will be responsible for the production of non-ferrous, nickel alloy, and stainless steel castings, and Endurance hard-facing and high-temperature brazing alloys.

TURRET GRINDING WHEEL CO., LTD., Sunbury-on-Thames, have achieved considerable savings in shipping weight and space by adopting plywood barrels for packing high speed cutting-off wheels for export. The barrels are supplied by Venesta Plywood, Ltd., and each weighs 11 lb., occupies a space of 3 cu. ft., and holds 100 wheels. Previously kegs were employed, each of which weighed 91 lb., occupied a space of 12 cu. ft., and held 200 wheels.

THE SKEFKO BALL BEARING CO., LTD., Luton, Beds., announce that The Associated Bearing Co., Ltd., has been formed in India to manufacture ball and taper roller bearings and certain other accessories. It is planned to start production towards the end of 1962 and when the plant is in full operation, approximately 700 people will be employed. The main shareholders are SKF, Gothenburg, The Investment Corporation of India, Ltd., and Skefko.

IPSEN INDUSTRIES, LTD., is the title of a new company which has been formed by Ipsen Industries Inc., Rockford, Ill., U.S.A., in association with Ipsen Industries International G.m.b.H., Kleve, West Germany, makers of atmosphere and vacuum automatic heat treating equipment and associated plant, to facilitate expansion of sales and service in Great Britain where several installations are already in operation and others are in hand. The address of the new company is 53 Victoria Road, Surbiton, Surrey.

OCCUPATION OF A NEW FACTORY.—A case heard recently at the City Court, Bradford, Yorks., concerning a small engineering firm which moved into premises without notifying the local factory inspector, serves as a reminder of the requirements of the Factories Act, that a factory owner must notify the Inspector of Factories one month in advance

of a move into new premises, in order that conditions can be checked as satisfactory. On behalf of the firm, it was stated that the approval of the Town Planning Department had been obtained, and that the factory had been occupied in ignorance of the regulations. A fine of £10 was imposed.

Viscount Nuffield Paper

The 1961 Viscount Nuffield Paper on "Some Aspects of Engineering Progress" will be presented to the Institution of Production Engineers on June 14, at 6.30 p.m., by Sir Willis Jackson, F.R.S., director of research and education, A.E.I. (Manchester), Ltd. The meeting will be held in the Large Lecture Theatre, Engineering Faculty, University of Bristol, and Mr. G. Ronald Pryor, M.I.Prod.E., president of the Institution, will be in the chair. Major developments will first be reviewed, and Sir Willis will then discuss some of their sociological consequences in industry and the community. Finally reference will be made to the educational implications "at the professional, technician, craft, and operative levels of industrial employment."

This meeting will be open to both members and non-members. Admission will be by ticket only, and applications should be addressed to The Secretary, Institution of Production Engineers, 10 Chesterfield Street, London, W.1.

Obituary

MR. C. R. JOHNSON, chairman and managing director of Target Engineering Co., Ltd., Northfield Road, Coventry, died on May 4 following a heart attack.

MR. ALEC H. MICKLEBURGH, a director of A. J. & F. Mickleburgh, Ltd., Milton Avenue, Harlesden, London, N.W.10, died suddenly on May 13 after a very short illness at the age of 67. The funeral will take place on May 18 at 3 p.m. from his residence at 22 St. Johns Road, Westcliff-on-Sea, Essex.

New Appointments

The following new appointments have been announced:—

MR. S. PARNELL, A.M.I.Prod.E., as deputy to the chief engineer of the Holman Group, Camborne, Cornwall.

MR. BRIAN PAVEY, B.Sc., A.M.Brit.I.R.E., as technical manager of Burtonwood Engineering Co., Ltd., Warrington, Lancashire.

MR. J. C. McVEIGH, M.A., M.Sc., A.M.I.Mech.E., as principal lecturer in the Department of Mechanical Engineering, Borough Polytechnic, Borough Road, S.E.1.

MR. F. B. COOMBS, M.I.Prod.E., chief designer of compressors, hoists and pneumatic tools, for Holman Bros., Ltd., Camborne, Cornwall, as general manager of the Holman subsidiary, Maxam Power, Ltd.

MR. JOHN R. MITCHELL as technical representative for the Sheffield area for Crofts (Engineers), Ltd., Thornbury, Bradford, 2. He can be contacted at the company's office at 12 Collegiate Crescent, Sheffield, 10.

MR. R. GIBSON, as representative in Manchester and Central Lancashire for Stubbs Welding, Ltd., Warrington, a

subsidiary of Peter Stubbs, Ltd. He will take over the territory on June 1 from Mr. B. T. BIBBY, who will be district sales manager in the Midlands.

MR. H. W. WINHAM, formerly general manager of Thor Tools, Ltd., as director and general manager of the John Vickers Group of companies (founders, engineers and patternmakers) with head offices at Alliance Works, Dodsworth Street, Darlington, Co. Durham.

Coming Events

INSTITUTION OF PLANT ENGINEERS.—*South Wales Branch*, May 23, at 7.30 p.m., at the South Wales Engineers Institute, Park Place, Cardiff; paper on "The Measurement and Analysis of Noise in Factories," by G. Berry, a principal scientific officer, Mechanisms, Metrology and Noise Control Division, National Engineering Laboratory.

Index to MACHINERY, Vol. 97

The index to Volume 97 of MACHINERY is now ready and copies may be obtained by subscribers, free of charge, on application to the Publishing Department, Machinery Publishing Co., Ltd., National House, 21 West Street, Brighton, 1. Binding cases are also available price 6s. 6d. post free inland (overseas 7s. 6d.).

Scrap Metals

MIDLANDS.—The local demand for steelworks scrap is strong, and one consumer is arranging for road deliveries to be accepted up till 9 p.m. each day (Monday to Friday). Grades No. 1 and 2 heavy steel, Grade No. 3 medium wrought iron and steel, and Grade No. 4 hydraulically compressed bales are all wanted, but the call for Grade No. 5 bales is less urgent, and merchants are delivering available supplies of light iron in loose form against orders for Grade No. 6 light wrought iron and steel.

Limited allocations are available for 0.04 S. and P. scrap, but to secure the higher prices paid for this type of material, it must be of the necessary quality, and deliveries must be made very early each week.

The easing of demand for 0.04 S. and P. short heavy steel scrap has continued, and allocations have been further reduced. These comments also apply to markets for No. 2 short heavy steel scrap, where allocations and temporary suspensions are in operation.

Movement of cast iron scrap is still keeping merchants busy, as demand for all grades, including cylinder iron, is keen. Complete car and lorry engines are wanted for cleaning by several Midland merchants.

Chipped steel turnings are still difficult to place because allocations and suspensions are in operation at the blast furnaces. Bushy turnings, likewise, are restricted, and loads are being sent to merchants with crushers instead of going direct to the blast furnaces.

Prices for the larger type destructor bales are being reduced but there has been no alteration for bales of sizes up to 12-in. cube.

Oversize cast material and steel for processing are fetching good prices as merchants are anxious to meet the increased requests from local steelworks.

Machine Tool Share Market

Very active conditions prevailed in stock markets during the period under review, and although the general tendency was irregular, the undertone remained firm.

The gilt-edged section remained quietly steady, and apart from undated British Government stocks, which suffered slight setbacks, short dated and kindred issues finished with a general improvement.

Commercial and industrial share markets were active and the position was generally bright despite some irregularity in price movements. Changes on balance were mainly to higher levels, and numerous features have been in evidence as a result of good company news and other special factors.

Among machine tool issues, Abwood Machine Tool advanced 3d. to 2s.; Brooke Tool, 3d. to 10s. 3d.; Chas. Churchill, 1s. to 10s. 1½d.; Craven Bros. (Manchester), 1s. 7½d. to 11s. 6d.; Alfred Herbert, 1s. to 77s. 6d.; A. A. Jones & Shipman, 2s. 3d. to 53s. 9d.; Kerry's (Gt. Britain), 3d. to 11s. 9d.; Macready's Metal, 6d. to 18s.; Newman Industries, 3d. to 6s. 3d.; Noble & Lund, 6d. to 6s.; F. Pratt, 1½d. to 17s.; Ambrose Shardlow, 1s. 3d. to 67s. 6d.; and Thos. W. Ward, 6d. to 81s. On the other hand, Edgar Allen lost 3d. at 46s. 6d.; Asquith Machine

Tool, 6d. at 12s. 6d.; Birmingham Small Arms, 1s. 6d. at 34s. 6d.; Butler Machine Tool, 7½d. at 16s. 3d.; Greenwood & Batley, 1s. at 28s.; John Harper, 4½d. at 8s. 3d.; Newall Engineering, 3d. at 11s. 9d.; Samuel Osborn, 1s. 9d. at 58s. 3d.; W. E. Sykes "B," 1s. at 32s. 6d.; and John Shaw & Sons (Wolverhampton), 1½d. at 20s. 3d.

MACREADY'S METAL CO., LTD. Dividend of 20 per cent.

Schuler Presses, Ltd.

L. Schuler A.G., Goepfingen, Wuerth., Germany, and Wickman, Ltd., Coventry, have formed a jointly owned British company with the title Schuler Presses, Ltd., to establish the production of certain Schuler presses in this country and to provide engineering and after-sales services to all Schuler press users. Wickman, Ltd., will act as exclusive sales representatives for the complete range of Schuler presses which includes open-fronted upright and inclinable; double-sided, eccentric, crank and drawing; transfer; high-speed blanking and 4-pillar dieing; knuckle joint embossing; high-speed notching; dial feed; and vertical cold flow types. Perforating machines are also made, and a complete tool design and tool-making service is offered.

COMPANY		Denom.	Middle Price	COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	2/-	Herbert (Alfred), Ltd.	Ord.	£1	77/6
Allen (Edgar) & Co., Ltd.	Ord.	£1	46/6	Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	22/6
	5% Prf.	£1	13/9*	" " "	"B" Ord.	5/-	20/6
Arnot & Harrison, Ltd.	Ord.	4/-	14/6	Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	53/9
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	12/6	" " "	7% Cum. Prf.	5/-	4/9
" " "	6% Cum. Prf.	£1	16/6	Kearney & Trecker-C.V.A., Ltd.	5½% Red.	£1	11/-
Birmingham Small Arms Co., Ltd.	Ord.	10/-	34/6	" " "	Cum. Prf.	£1	13/9
" " "	5% Cum.	£1	14/6	Kearns (H. W.) & Co., Ltd.	Ord.	5/-	24/3
" " "	"A" Prf.	£1	17/-	Kerry's (Gt. Britain), Ltd.	Ord.	5/-	11/9
" " "	6% Cum.	£1	17/-	Macready's Metal Co., Ltd.	Ord.	5/-	18/-
" " "	"B" Prf.	£1	16/6	Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
" " "	4% 1st Mort. Deb.	Stk.	92	Massey (B. & S.), Ltd.	Ord.	5/-	12/-
British Oxygen Co., Ltd.	Ord.	5/-	26/-	Newall Engineering Co., Ltd.	Ord.	2/-	11/9
" " "	6% Cum. Prf.	£1	20/6xd	Newman Industries, Ltd.	Ord.	2/-	6/3
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	10/3	" " "	6% Prf. Ord.	5/-	5/-
Broom & Wade, Ltd.	Ord.	5/-	28/3	Noble & Lund, Ltd.	Ord.	2/-	6/-
" " "	6% Cum. Prf.	£1	16/6	Norton, W. E. (Holdings), Ltd.	Ord.	2/-	8/-
Brown (David) Corporation, Ltd.	Ord.	£1	16/-	Osborn (Samuel) & Co., Ltd.	Ord.	5/-	58/3
Buck & Mickman, Ltd.	Ord.	£1	17/-	" " "	5½% Cum. Prf.	£1	23/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3	Pratt (F.) & Co., Ltd.	Ord.	5/-	17/-
" " "	5% Cum. Prf.	£1	14/3	Sanderson Kayser, Ltd.	Ord.	10/-	38/9
Churchill (Charles) & Co., Ltd.	Ord.	2/-	10/1½	" " "	6½% Cum. Prf.	£1	17/-
" " "	6% Cum. Prf.	£1	25/4½	Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	11/3
Clarkson (Engrs.), Ltd.	Ord.	5/-	38/9	Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	67/6
Cohen (George), 600 Group, Ltd.	Ord.	5/-	14/6	Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	20/3
Coventry Gauge & Tool Co., Ltd.	Ord.	£1	12/6	" " "	Ord.	4/-	19/6
" " "	4½% Cum. Prf.	£1	32/4½	Sheffield Twist Drill & Steel Co., Ltd.	5% Cum. Prf.	£1	14/3
" " "	5% Cum.	£1	16/3	" " "	Ord.	5/-	8/10½xd
Craven Bros. (Manchester), Ltd.	Ord.	5/-	11/6	Stedall & Co., Ltd.	"B" non-voting Ord.	10/-	32/6
Elliott (B.) & Co., Ltd.	Ord.	1/-	3/7½	" " "	Ord.	5/-	19/3
" " "	4½% Cum. Prf.	£1	12/-	Tap & Die Corporation, Ltd.	4½% Deb.	5/-	82½
Expert Tool & Case Hardening Co., Ltd.	Ord.	2/-	2/7½	" " "	[1961-1977]	5/-	19/3
Firth Brown Tools, Ltd.	Ord.	£1	11/-	Wadkin, Ltd.	Ord.	10/-	26/-xd
Greenwood & Batley, Ltd.	Ord.	10/-	28/-	Ward (Thos. W.), Ltd.	Ord.	£1	81/-
Harper (John) & Co., Ltd.	Ord.	5/-	8/3	" " "	5% Cum.	£1	14/-
" " "	4½% Cum. Prf.	£1	12/-	" " "	1st Pref.	£1	22/6
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The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error.

* Sheffield price.

‡ Birmingham price.

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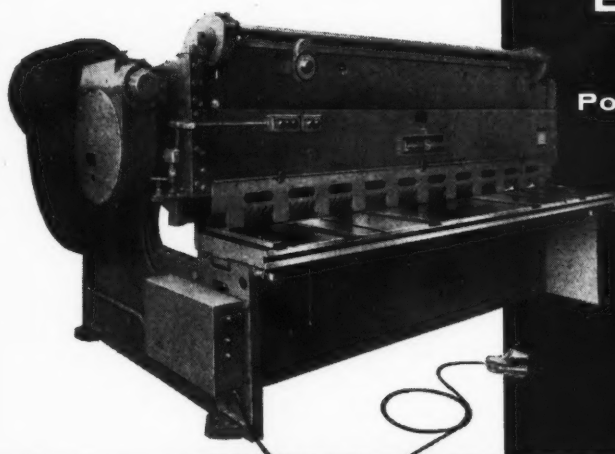
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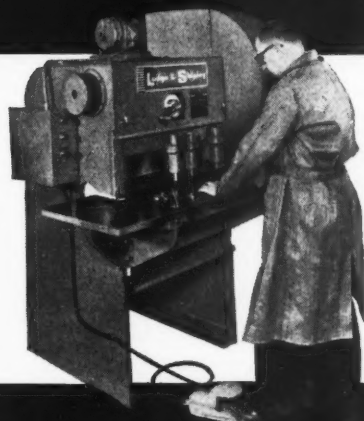
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slant blade cutting,
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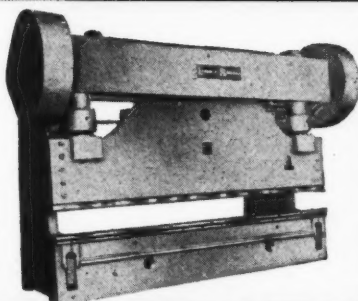
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Special features include
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etc.



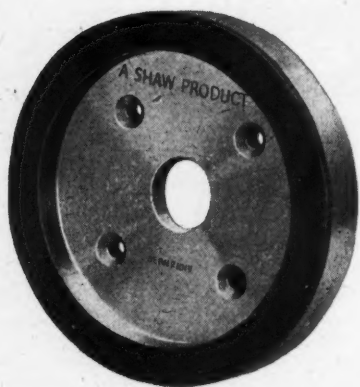
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J. W. CANNON,
"RANELAGH," CHOSEN DRIVE,
CHURCHDOWN, GLOUCESTER
TELEPHONE: CHURCHDOWN 2171.

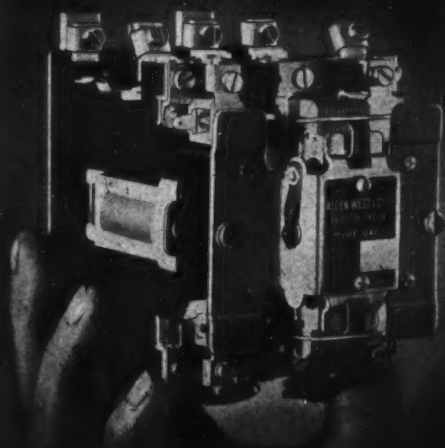
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Drilling area may be either circular or rectangular and all spindles are freely adjustable with individual vertical adjustment for drill wear.

Max. Drilling area (circular frame) 18in. dia.

Max. Drilling area (rectangular frame) 24in. x 14in.

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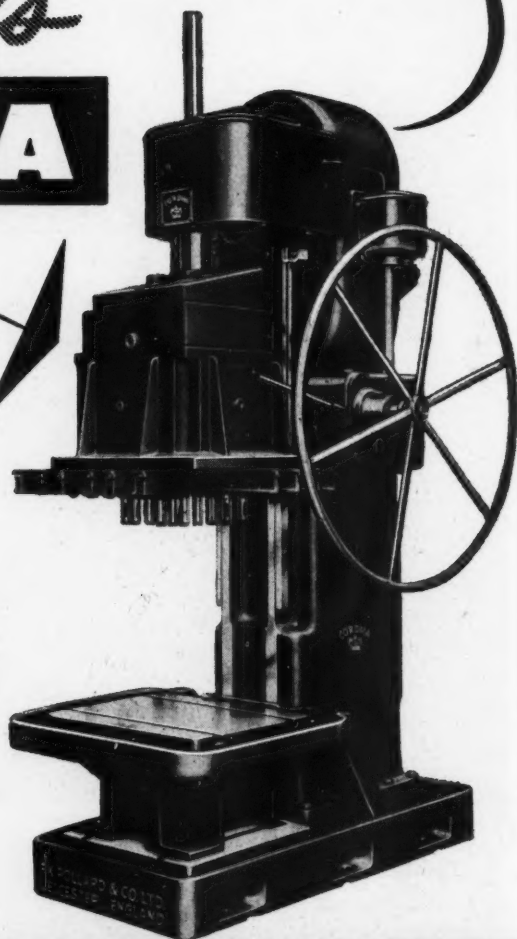
Max. number of spindles No. 2 M.T. 16

Max. Drilling capacity (examples) 6— $\frac{3}{4}$ in.,
12— $\frac{3}{4}$ in. or 18— $\frac{3}{4}$ in. holes.

Area of box table 28in. x 22in.

A larger model is available and complete details of both machines will be sent on request.

Both machines are fitted with rapid power traverse to slide.



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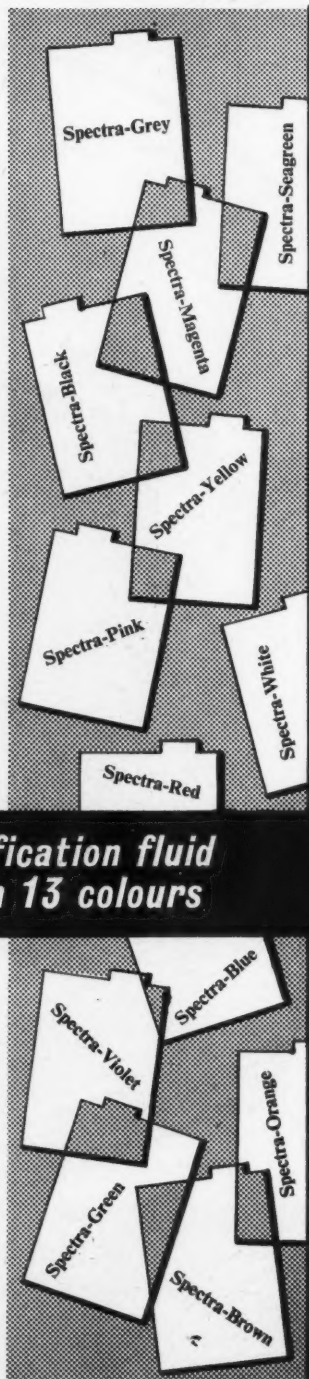


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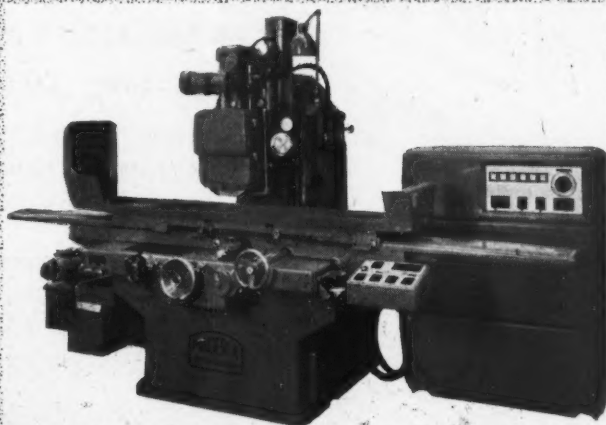


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crush formed full profile wheels

The most advanced machine of its class, the fully automatic Magerle is designed both for surface grinding and high production profile work.

By the Magerle method, crush formed work is now produced as easily as surface grinding. Let us send you full particulars on this versatile, high precision machine.

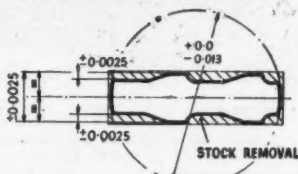


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PRODUCTION PROFILE GRINDER

- Constant peripheral wheel speed.
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DIMENSIONS IN MILLIMETRES

GRINDING TIME PER PIECE	9 secs.
ACCURACY OF FORM	0.0002in.
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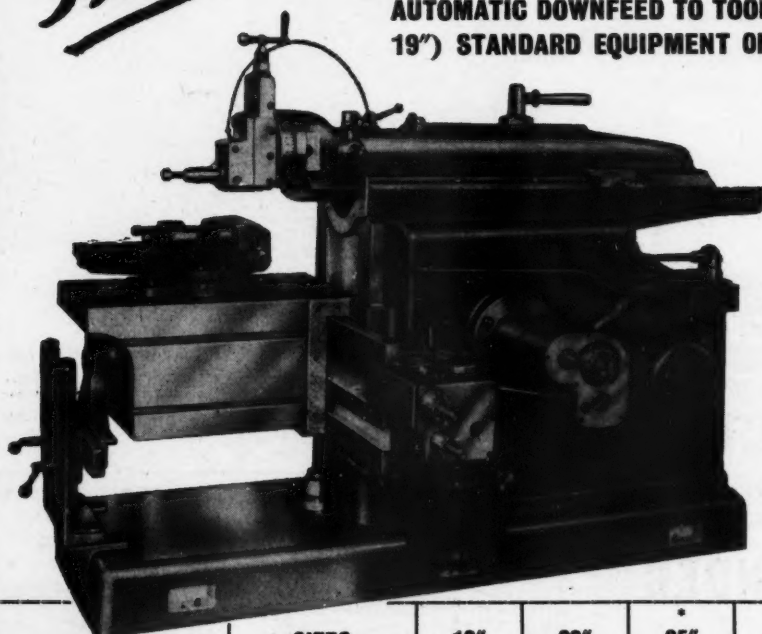
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- WIDE ANGLE V GUIDES.
- 34" LONG. TABLE FEED ON ALL MODELS.
- TOOL LIFTING DEVICE, SWIVEL TABLE AND AUTOMATIC DOWNFEED TO TOOLPOST (EXCEPT 19") STANDARD EQUIPMENT ON ALL MODELS.



EXCLUSIVE DISTRIBUTORS
IN THE U.K.

SIZES	19"	22"	25"	29"	34½"
* INDICATES RAPID TRAVERSE TO TABLE AVAILABLE AS AN EXTRA					
DELIVERY	May	May	STOCK	RAPID TRAVERSE STOCK	June

TIMES

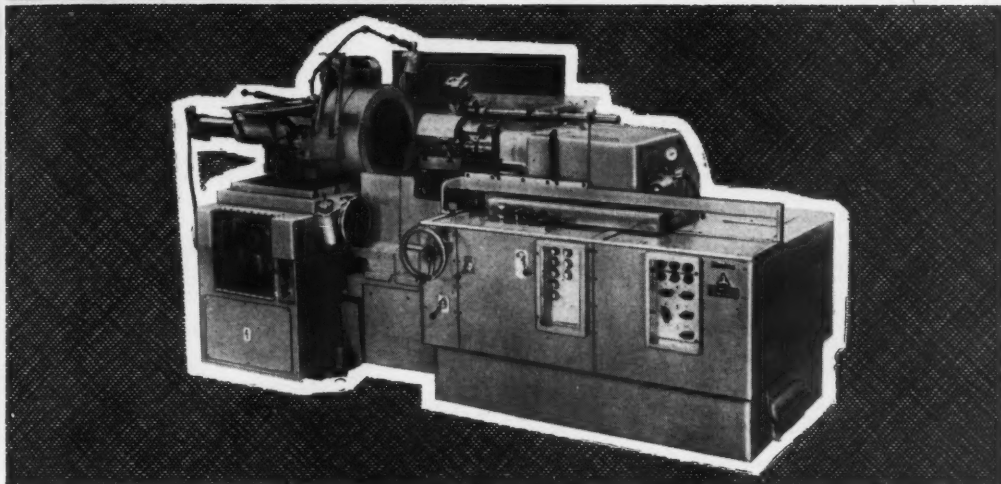
THE TIMES MACHINERY CO. LTD.,
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Telephone: Colnbrook 2442

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KAMENICEK BDA 63

INTERNAL GRINDING MACHINE



The machine is intended for multiple grinding of cylindrical holes of medium and large size with the help of an automatic work cycle. For single part production in small batches hand control of the machine may be used.

**Send TODAY for fully
informative leaflet
from Sole Agents**

Brief Specifications:

Swing in guard	24 $\frac{1}{2}$ "
Swing with wheelhead swivelled 45°	19 $\frac{1}{8}$ "
Min. economical dia. of hole ground	3 $\frac{1}{8}$ "
Max. dia. of hole ground	9 $\frac{1}{8}$ "
Diameter of hole ground by resetting of wheel spindle	15 $\frac{1}{2}$ "
Max. movement of longitudinal slide	23 $\frac{1}{2}$ "
Max. depth of hole ground	12 $\frac{1}{2}$ "

Always Selsons for Machine Tools



The Selson Machine Tool Co. Ltd

SUNBEAM ROAD, LONDON, N.W.10.

Telephone Elgar 9000

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And at Kingsbury (Nr. Tamworth) Manchester, Glasgow, Swansea, Newcastle-on-Tyne,
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**Chamfer 500% faster—
more accurately—
with
a ground finish**

THE

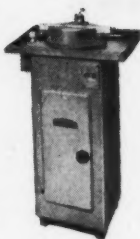
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**EDGE CHAMFERING
MACHINE Model KB2**

Here is a machine to cut the cost of finishing machine parts on a wide variety of components. Width of chamfer can be varied from 0 — $\frac{1}{8}$ " and roughing and finishing is completed at one pass.

High-class construction throughout, with hardened and ground prismatic guide ways.

COMPLETE DETAILS ON REQUEST



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**ZWICKY HOUSE, 241-247, HIGH STREET, ACTON,
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Phone: ACOrn 6011

Ask for a demonstration



Simplified Control with

NEUMO

AIR OPERATED PUMPS and MOTORS

Control of liquid flow by means of a simple valve in the delivery line is all that is required when using Neumo positive displacement air operated pumps. This valve may be at any distance from the pump, enabling operators to control pumps at distant points of delivery. No extra control gear is employed, the pump merely stalling by back pressure and recommencing delivery upon release of the pressure. Undue pressure in the line is avoided by pre-setting automatic over-load devices in the pump.

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Telephone: Peacehaven 2115 & 3354

Pumps are made in a wide variety of materials to cope with all liquids. With only two moving parts they are a safe, reliable means of obtaining reciprocating motion and again may be stalled without damage.

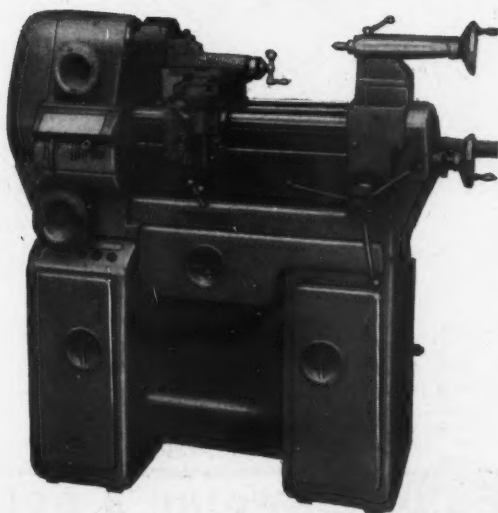
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**Kneller
Multi-Purpose
Lathes
in the
Development
Department of
Hymatic
Engineering
Co. Ltd.,
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KNELLER MULTI-PURPOSE LATHES

Although termed lathe, this versatile machine has additional characteristics such as the tailstock unit can be traversed by hand or mechanically with a range of feeds. A vertical movement to the saddle table providing characteristics of a horizontal boring machine, with thread cutting facilities. A facing slide is supplied to perform this operation. This machine is an essential for toolrooms and research departments, where pre-production and small quantities of accurate and intricate machining are required. Also being used in Technical Colleges for educational purposes.



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Stag Major *

Superweld Tools

The flash — butt welded STAG MAJOR super high speed steel tip on a carbon steel shank gives maximum performance with an exceptionally long cutting life.

Our stock of these famous tools covers all standard shapes and sizes, and we will gladly send you an illustrated tool chart.

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Hand operated. Moving head. Available with Horizontal and Vertical spindles. Table supported on fixed knee. Large clamping area and ample working height. Lever operated vertical movement with hand-wheel for fine feeds and 6 rotatable stops. Cross traverse controlled by handwheel with accurately divided drum and adjustable stops.

29½" × 7½" table. Travellers: 17½" long., 7" trans., 15½" vertical. Spindle speeds: horizontal: 60 to 300 and 400 to 2000 r.p.m., vertical: 2000, 3500 and 5000 r.p.m.



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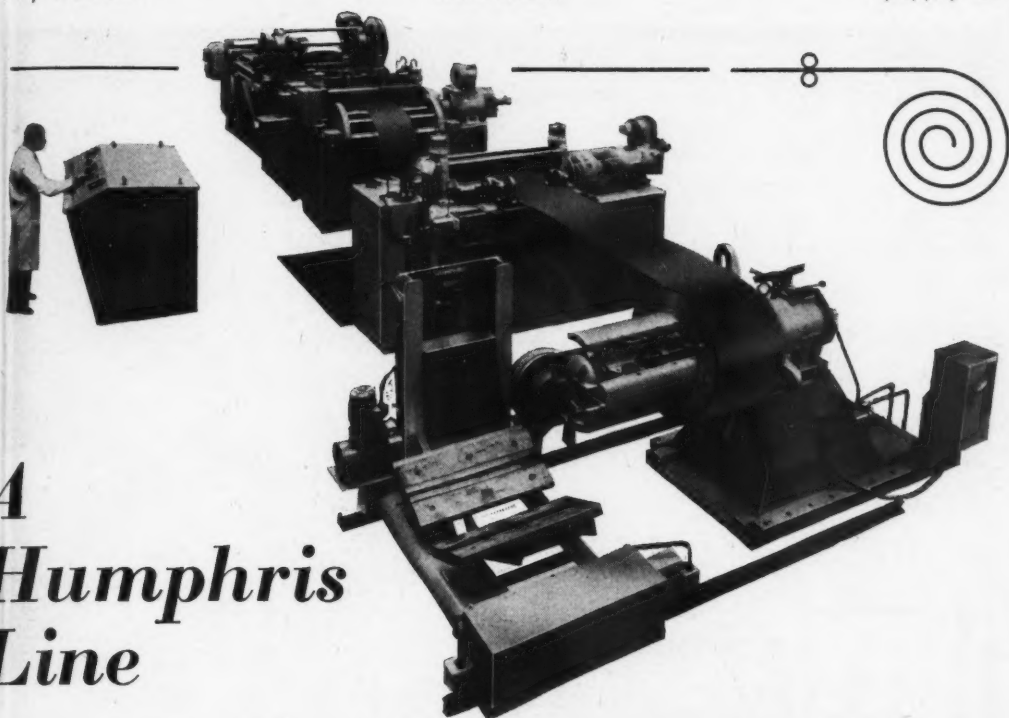
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A Humphris Line

for cutting to length

COLD ROLLED
GRAIN ORIENTED
SILICON STEEL

for Power Transformer Core Plates

3 ton coils—lamination lengths between 7 inches and 12 feet—widths between 2 inches and 36 inches—a peak strip speed of over 300 feet per minute—lengths within tolerance of .010 inches—first sheet to tolerance each time!

All this was achieved in the line illustrated and is typical of the performance attained in the dozen or more lines built for large transformer manufacturers during the last three years.



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130 SHAFTS FACED AND CENTRED PER HOUR

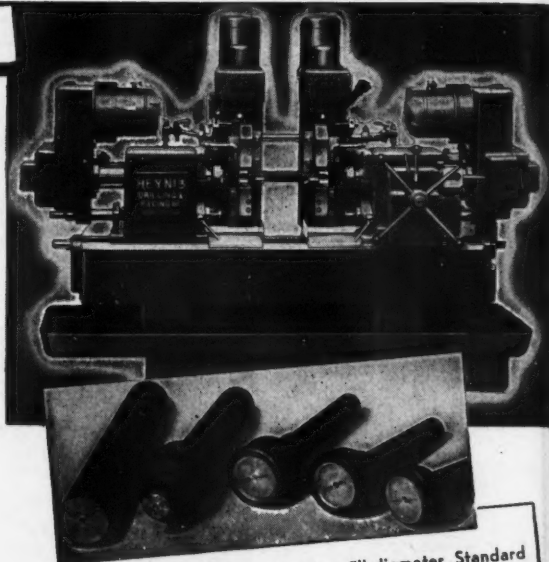
Facing $\frac{1}{8}$ " off each end and drilling $\frac{1}{16}$ " centres in $2\frac{1}{2}$ " diameter Electric Motor Shafts in a floor to floor time of 27 seconds, is typical of the high production which can be achieved on the —

HEY No. 3 DOUBLE ENDED CENTRING & FACING MACHINE

- Perfect alignment of centres
- True faces and accurate lengths
- Turned finish on faces
- Eliminates subsequent facing down to centres or recentering



ENGINEERING CO. LTD.
COVENTRY PHONE: COVENTRY 88641



We also manufacture Rotary Cam and Profile Milling Machines, Short Thread Milling Machines, Multiple Drilling Heads and Machines, Tapping Machines, Gear Tooth Rounding Machines, Special Machine Tools for High Production.

Face 5" diameter, Standard Vices for maximum bar capacity of $6\frac{1}{2}$ " or 8" diameter. Minimum length handled 3". Standard bed length to take work up to 24", 48", 72" or 108" long.

NRP 1527

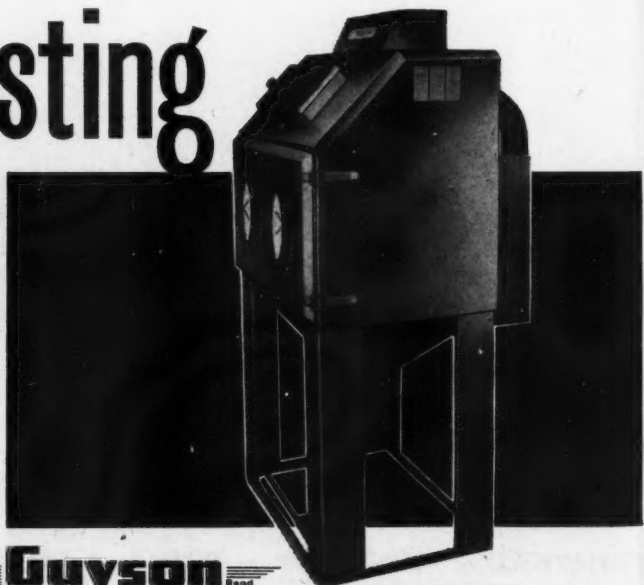
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**where you want it -
when you want it**

The Guyson range of Light Industrial Shotblast Cabinets covers all phases of Light Industrial Shotblast requirements in Toolroom, Production Bay, Laboratory or Repair Depot. These virtually self-contained units can be easily moved to any part of the production line to Clean, De-scale, Matt-finish or Metal Sheen components in Metal, Glass, Plastics, Ceramics, etc., saving valuable time.

Why not send for Bulletin 400/20 (B) today and learn how Guyson Equipment can help your production.

See us at the
INTERPLAS EXHIBITION
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Guyson Regd

Illustrated is the Model 400/20.

GUYSON INDUSTRIAL EQUIPMENT LTD.

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Tel: Otley 2456. Grams: "Guyson Otley"

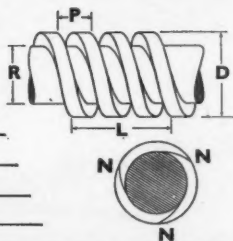


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**ACTUAL MANUFACTURERS OF PRECISION TRANSMISSION
SCREW THREADS ($\frac{5}{8}$ " dia. to 10" dia. : up to 30' long according to dia.) AND NUTS
—ALSO EXTRUDER SCREWS FOR THE PLASTICS INDUSTRY**

The following information will be of assistance when making enquiries:—

TYPE OF THREAD _____
HAND OF THREAD _____
PITCH (P) _____
LEAD (L) _____
No. OF STARTS (N) _____
OUTSIDE DIAMETER (D) _____
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TYPE OF MATERIAL _____
PURPOSE _____



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The Dunbar & Cook Collet Chuck



Designed for use with "Ward" 2A, 3A or "Herbert" 2D and 4 Senior Capstans and Air operated Lathes, this oversize collet chuck enables second operation work up to four inches diameter to be accommodated but retains all the benefits of a ball chuck. Can now be supplied as an Air Chuck to suit any lathe.

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CUT YOUR SAWING COSTS

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METAL CUTTING BAND SAWS

HARD TEETH - FLEXIBLE BACK

Unsurpassed for fast cutting and long life

Perfect tooth contours, controlled straight line depth of hardness, uniformity of temper ensure all "Speed" users fast, accurate, economical sawing for every job whether on ferrous or non-ferrous metals, plastics or laminated timbers. Nimonic and Stainless Steel castings can be cut at friction speeds. Supplied in widths from 1/4 in. to 1 in. with raker or skip teeth. Our technical representatives are at your service. Consult us on any cutting problem.

Also:

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- "Super-Speed" Hacksaw Frames.
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MOWBRAY STREET • SHEFFIELD 3 • ENGLAND

THE METAL SAWING SPECIALISTS

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$\text{CH}_3 \text{ COCH}_2 \text{ C(OH) (CH}_3)_2$

These are familiar symbols; *far* from meaningless to the Plant Engineer.

They represent one of the hundreds of chemicals which are enemies in minor or major degree of the materials with which they are in contact—some are pernicious enemies.

But for the manufacturers of the plant and equipment in which they are contained or processed, life is not so difficult as it once was.

Materials are now more or less freely available which are virtually impervious to attack by corrosives or solvents. Difficulties still are encountered, especially in terms of the character of the materials which do not always lend themselves to the conventional techniques by which the older metals are fabricated. Their initial cost, too, is high.

The skill and ingenuity of the manufacturer leads him to employ divers means to overcome these difficulties. For example, chemically inert materials frequently are used as linings on the surfaces of vessels which are fabricated from materials which, if unprotected, would have only a short life.

However, on plant and equipment such as pumps, agitators, mixers, valves, etc., there remains the problem of sealing against leakage where a rotating shaft passes through the body or casing. Here, a pump, or a vessel, is most vulnerable.

Means must be employed not only to seal against leakage of liquid or gas which may be highly corrosive or solvent, but the method of sealing must be capable of resisting any tendency for shaft movement to impair its efficiency.

Today, mechanical shaft seals are widely used for this purpose.

The Plant Engineer and the Manufacturer of the plant and equipment must decide of whose manufacture the mechanical seal must be.

This must boil down to a question of

confidence in their supplier; that is to say, confidence born of previous experience of a supplier's recommendations, or if a new supplier, knowledge of that supplier's reputation for supplying mechanical shaft seals, which by their performance in the field have proved they may be used with confidence.

In the chemical and allied industries, the mechanical shaft seals manufactured by CRANE PACKING LTD. have proved in service over many thousands of hours of operation that the Company's understanding and experience of applications involving the handling of corrosives and solvents is worthy of any users' confidence.

One mechanical shaft seal which has earned for itself an outstanding reputation in the chemical and allied industries, in a relatively short space of time, is the CRANE Type 109. This was the *first* mechanical shaft seal ever to be manufactured in this Country capable of sealing against *other than* mildly corrosive or solvent liquids and gases.

Normally the "109" has a pressure ceiling of 150 p.s.i.g., but by using a balanced version of the seal it is possible to seal against pressures as high as 750 p.s.i.g. Its temperature range is up to +450°F. (232°C.).

The CRANE Type "109" is more fully described in Information Bulletin No. 7 now in its fourth printing.

CRANE TYPE 109
MECHANICAL
SHAFT SEAL

Stationary
Seat

Rotating
Seal Unit

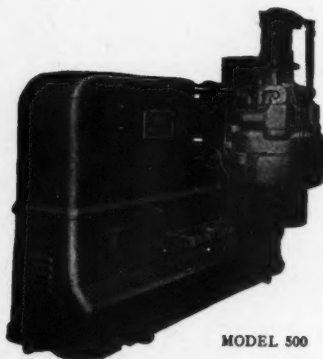


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**Crane
Packing**
LTD
OF SLOUGH
ENGLAND
A COMPANY

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British Built



MODEL 500

ZINC LEAD TIN

COULTHARD MADISON-KIPP DIECASTING MACHINES

The castings from this machine are first class precision diecastings possessing

- ★ LIGHTNESS
- ★ STRENGTH
- ★ STABILITY
- ★ ACCURACY
- ★ PERFECT FINISH

Production's much faster with this modern Kippcaster

Wm. COULTHARD & CO. LTD. DURRANHILL, CARLISLE 21418.

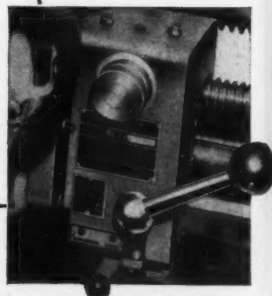


SCREWCUTTING

Do you still use chalk?

In the same way that the chasing dial has superseded the old method of marking chuck, headstock, leadscrew collar and bracket; the AINJEST HIGH SPEED SCREWCUTTING ATTACHMENT has established a further major advance in screwcutting techniques. Its use on standard centre lathes allows the automatic engagement and disengagement of the leadscrew at the highest spindle speeds of which the machine is capable.

- * The cut cannot be started at the wrong point.
- * The cut is stopped accurately so that external or internal threads can be cut tight to a shoulder at high speeds.
- * Tungsten carbide tools can be used with great advantage.
- * Chasing dial is eliminated.
- * The attachment remains in position, ready for use, without restricting the versatility of the lathe.



High Speed SCREWCUTTING ATTACHMENT

Stockists of carbide threading tools

Write for details and prices to Dept. A.S.C.

SAUNDERSON & COSTIN LTD. · HIGHCLERE · NEWBURY · BERKSHIRE · ENGLAND Tel: HIGHCLERE 448

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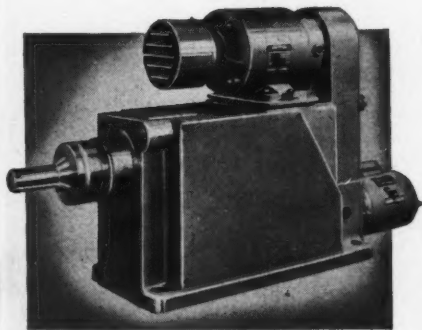
Precision x 4 ...



For this 4-head
Precision Boring Set-up
at their Hillington Factory

ROLLS-ROYCE *selected*

H.P.E Fine Boring Unit Heads



May we help with your Fine Boring problems?
We offer a range of standard heads and base units
together with a technical design service for special
machines.



AE

An Associated Engineering Limited Company

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For really Precise Grinding—Swiss **TRIPET MAR 200** Universal Hydraulic Cylindrical Grinder

Tolerances of .00004" can be held and both bore and face ground at the same work setting, ensuring perfect squareness. Particularly suited to internal work, yet fully universal. The work head swivels through 90° for taper grinding and rotary surface grinding. Work head drive is steplessly variable from 0 to 1900 r.p.m. Automatic feed is from .00004" to .0004" and semi-automatic diamond dressing compensates for wheel wear. Internal grinding spindles are quickly interchangeable for diameters .040" to 2". Table reciprocations can be as small as .080".

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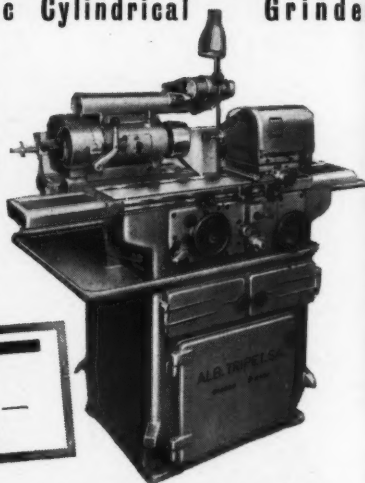
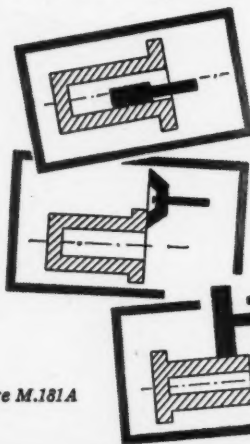
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DOWDING & DOLL LTD

346 KENSINGTON HIGH STREET, LONDON, W 14

Tel: WESTERN 6077 (8 lines) Telex: 23182 Grams: ACCURATOL LONDON TELEX



Grinding capacity, internal .040" to 2"
Grinding length 7 1/2"
Grinding spindle speeds,
(internal) 18,000 to 120,000 r.p.m.
(external) 3350 to 5000 r.p.m.

Air Gauging—SINGLE or MULTI-DIMENSIONS

with

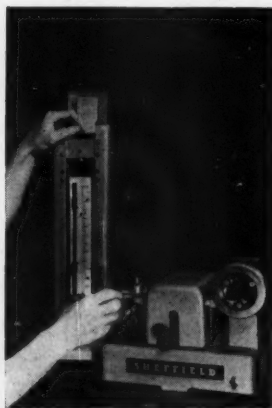


PRECISIONAIRES

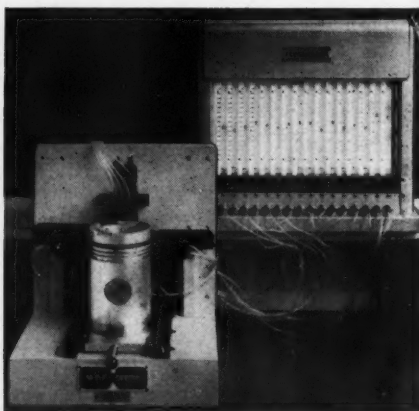
THE MOST USABLE OF ALL AIR GANGES!

The Airtight head accommodates a highly sensitive micro switch or switches and an arrangement of differential threads which are connected to the gauge plunger, one end of which makes contact with the workpiece. The fine adjustment enables the operator to adjust within .0001" or 0.002 mm. The gauge is normally used in conjunction with a relay box containing transformer and relays, which receives 220-240 volts from the mains, and supplies a secondary 12 volts for operating the gauge head and relays. Both single and 2 stage models available.

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Airtight Indicator



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—and so will you if you specify

Special chipping characteristics eliminate swarf jamming.

Automatics can operate at maximum speed and feed.

Longer tool life—normal angles on tool tips can be used.

Lower labour costs—one man can watch several machines.

Output dramatically increased.

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152**

ALUMINIUM ALLOY
FREE MACHINING BAR

Write **TODAY** for Full Technical Details.

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Telephone: LANGLEY 301

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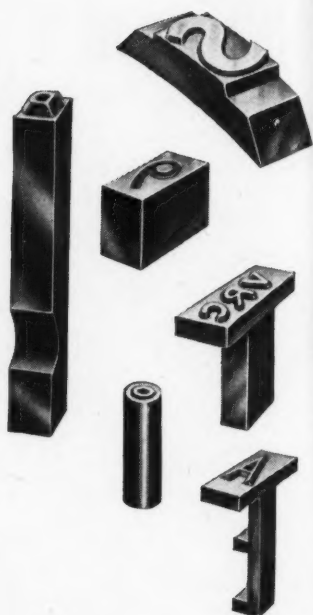
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awkward shapes

Standard type for engineers too.
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B.S.A. No's. 7 and 8 Centreless Grinders.
CHURCHILL 'HCY' and 'HBA' Internal
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LANDIS 4 x 12 Type C Plain Grinder.
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GISHOLT 1L & 2L Capstan Lathes.
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ALSO

B.S.A. 6 x 12 and 28 Multi-Tool Lathes.
B.S.A. 50H Honing Machines.
EX.CELL.O Fine Boring Machine.

The above offered subject to prior sale. All
machines motorised suitable for 400-440 volts, 3
phase, 50 cycle supply.

We offer good prices for your surplus plant.
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(B.S.A. TOOLS DIVISION)

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TELEG: REBUILT BIRMINGHAM

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MODEL 96 LM

SURFACE GRINDERS

Top rates of production are linked with a high order of accuracy when 12 cast steel gear housings for the Jones KL66 crane pass under an 18-piece segmental wheel on this model 96 LM Heavy Duty Surface Grinder. The large diameter table revolves at 8 R.P.M. $\frac{1}{8}$ in. of metal is removed and the components are sized to ± 0.002 in. Whilst the Lumsden model 96 LM is designed to tackle just such a job as this, in the most rapid, precise and economical manner possible, a complete range exists, from which to choose a machine ideally suited to your own grinding requirements.

*Close Limits
and High Output
on
Differential Housings
for JONES' CRANES*



Manufacturers:

LUMSDEN MACHINE CO. LTD. GATESHEAD

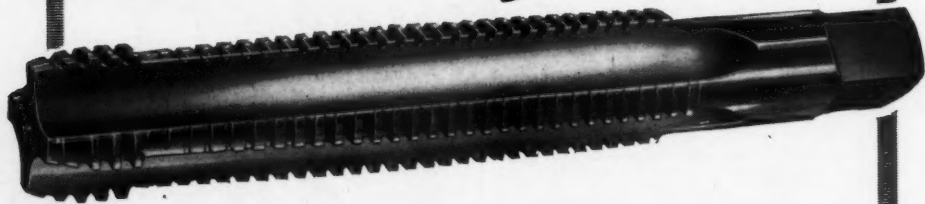
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from Stock!★ SEND FOR SPECIAL TAP AND DIE
STOCK LIST**ACME TAPS - 4 weeks**

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CALIPER GAUGES**These adjustable plain caliper gauges are available
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ended type shown is carried in an
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red/green colour coded ends.
Write for price lists.**YORKSHIRE PRECISION GAUGES LTD.****HATFIELD : Nr. DONCASTER : YORKS**

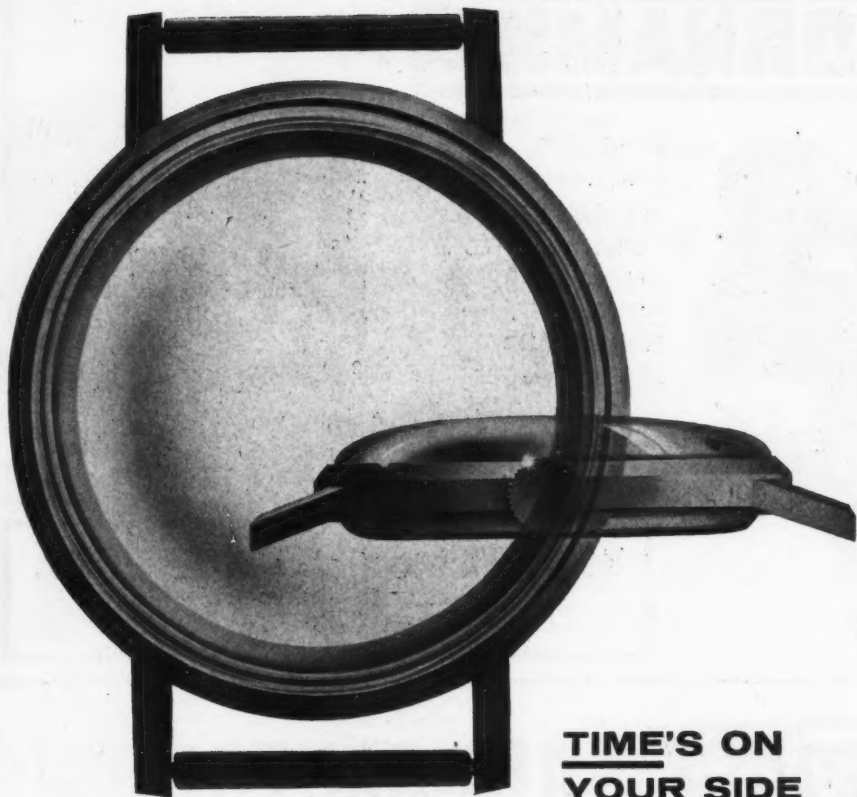
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TYPE E:
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adjustable
anvil for
undercuts,
etc. Range
0-11½" dia.


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Industrial Diamonds in one form or another help to make practically everything from watch cases to washing machines. Only diamond tools can cut, grind or polish with the speed and accuracy needed today.

To find out if diamond abrasives, diamond tools or diamond impregnated wheels can help you in *your* problem, please get in touch with the Industrial Diamond Information Bureau. This Bureau is backed by the world's largest laboratory devoted to diamond technology — The Diamond Research Laboratory in Johannesburg. For information and advice, without obligation, please write to the address below.

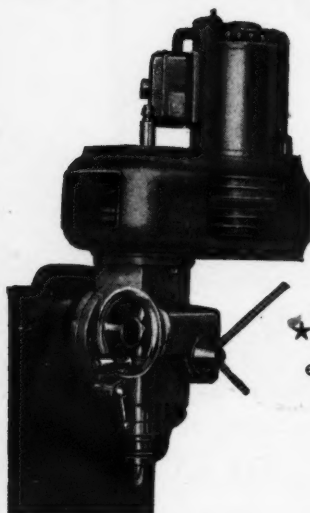


The Industrial Diamond Information Bureau

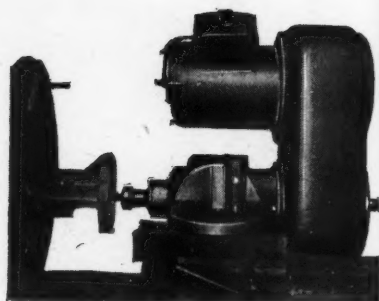
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ON LATHES,
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AIR CLUTCHES

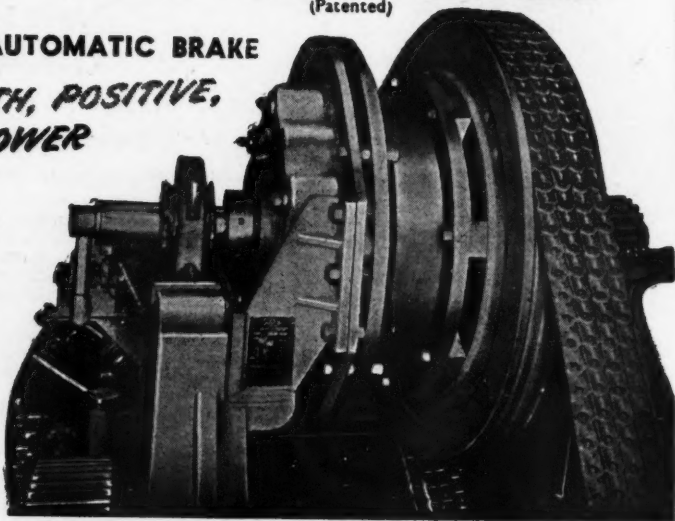
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WITH COMBINED AUTOMATIC BRAKE

**— FOR SMOOTH, POSITIVE,
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These clutches not only ensure full power with smooth, shock-free engagement at higher speeds, but also contribute to faster production and better all round performance on all types of Presses, Forging Machines, Press Brakes, Shears, etc. Synchronised, powerful, quick acting braking ensures positive safe stop which means quick and accurate control with increased safety for operators and tool setters.

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**WIDE RAM
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- ★ Available in sizes from 100 to 1,000 tons, this specially designed multi-purpose press enables pre-forming, setting and straightening to be carried out in addition to trimming and piercing operations.
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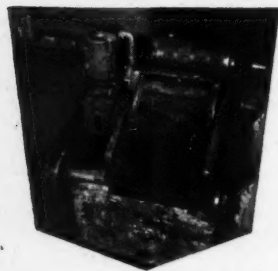

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SLEEVES & SOCKETS

FOR EVERY DUTY

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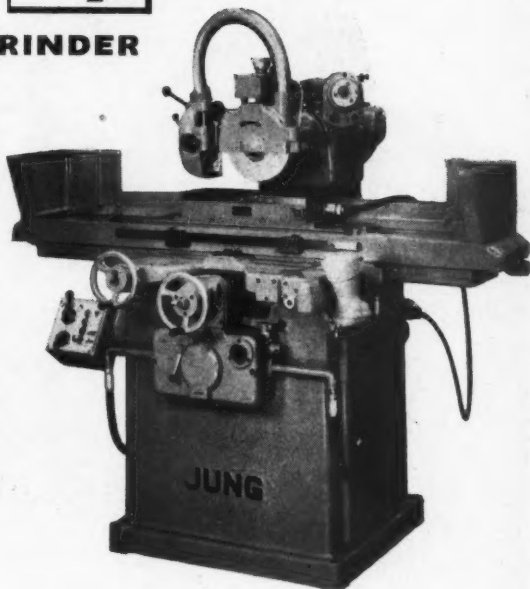
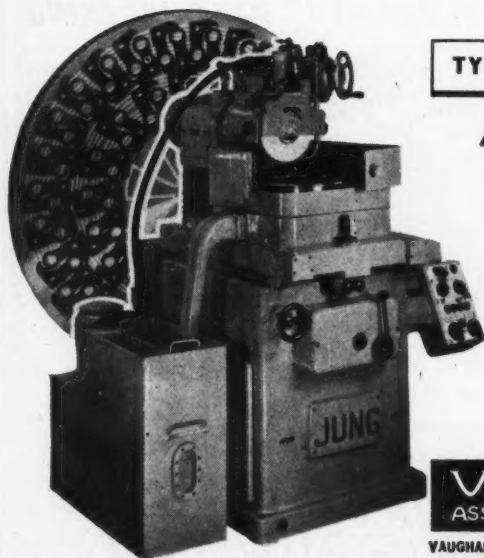
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CENTEC

INDEX TABLES

in various sizes for VERY FAST INDEXING

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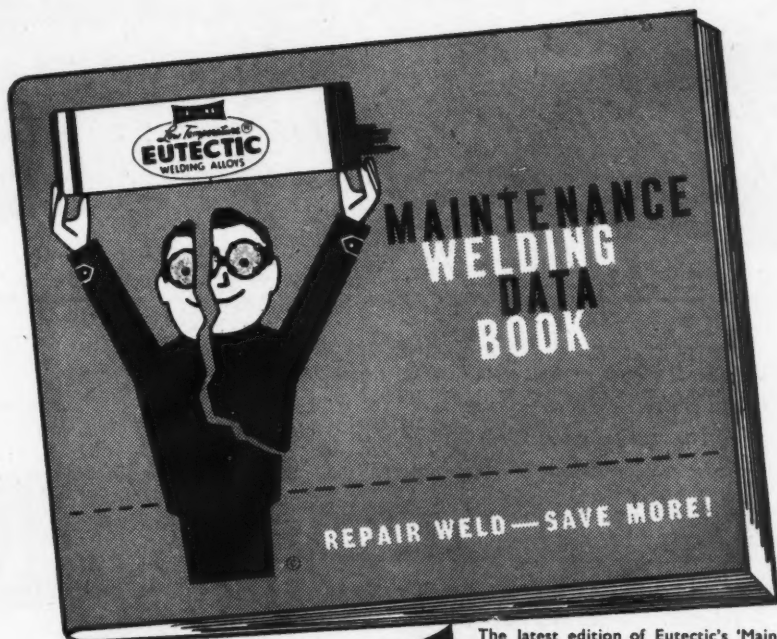
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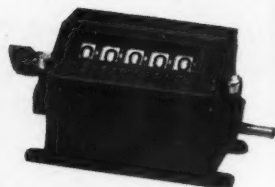
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 Either a Veeder mechanical or electrical counter
 will produce your facts in figures with
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Heavy duty counter

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You can achieve this notable feat with a B.J-D Swarf Breaker.



Swarf Breaker
 and mechanical feeder

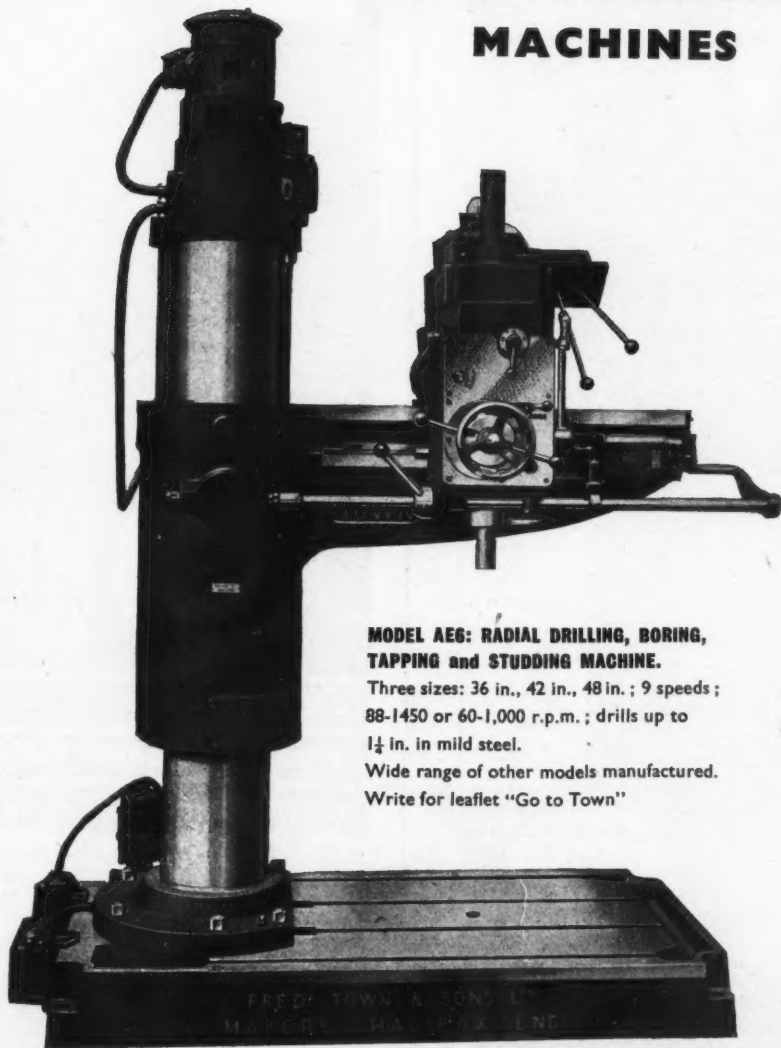
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Three sizes: 36 in., 42 in., 48 in. ; 9 speeds ;
88-1450 or 60-1,000 r.p.m. ; drills up to
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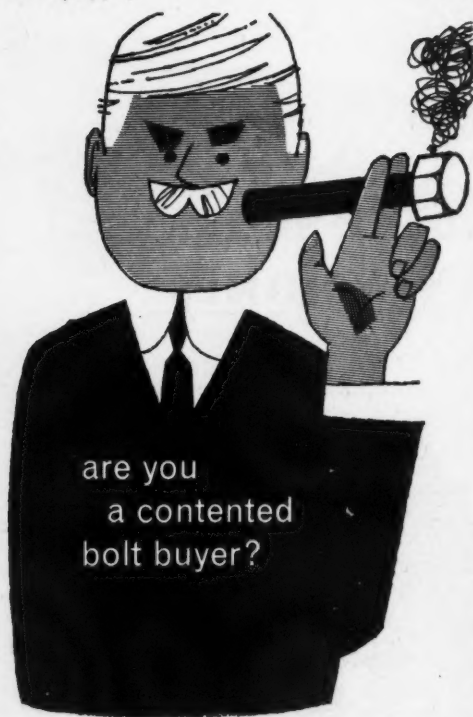
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MODEL BFT. 125/1
5in. Dia. Spindle

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	BFT.63	BFT.80	BFT.100	BFT.125
Dia. of Spindle	2½in.	3½in.	4in.	5in.
Max. traverse of Spindle ..	22½in.	28in.	36in.	44½in.
Max. distance Spindle to table	28in.	36in.	44½in.	55in.
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Working surface of revolving table	36in. by 28in.	44½in. by 36in.	50in. by 44½in.	64in. by 56in.
Max. distance between Facing Head and Outer Support ..	5ft. 11in.	7ft. 5in.	9ft. 4in.	11ft. 10in.
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STIEBER CLAMPING TOOLS

"Spiral" type



Internal grinding of bush concentric to O.D.

**Great gripping power:
wide workpiece tolerance**

Available in a wide range of arbors, mandrels and chucks in which the clamping element is a precision spiral sleeve expanded or contracted by a taper plug, giving a very large area of surface contact and great gripping power with relatively wide workpiece tolerances.

Other types

Enquire also about "SEGMENTAL" type clamping tools for even wider workpiece tolerances and "PERFECT GRIP" for the last word in precision clamping.



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**Specialists in
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Telephone No. 2502 Halifax

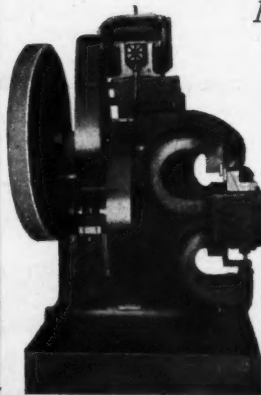


Manufacturers of

**SINGLE ENDED PUNCHING
AND SHEARING MACHINES**
with capacities from: punching
3/4 in. through 3/4 in. and shearing
3/4 in. plate . . . to: punching
3/4 in. through 3/4 in. shearing 3/4 in.
plate and angle cropping 4 in.
by 4 in. by 3/4 in.


BAR SHEARING MACHINES
from 3/4 in. dia. up to 2 in. dia
mild steel.

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from 3/4 in. dia. through 3/4 in. to
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up to 4 in. by 4 in. by 3/4 in.
Shearing up to 3/4 in. thick.



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with Rocol R.T.D. compound**

Operation: Drilling with 5/32" drills.

Material: Special Composition Stainless Steel.

Problem: Drill had to be re-ground twice for each hole—even then the drills were "jibbing" and breaking off.

Solution: R.T.D. Compound was applied to the drills. Fifteen holes were then drilled before re-grinding—and the finish was 100% better.

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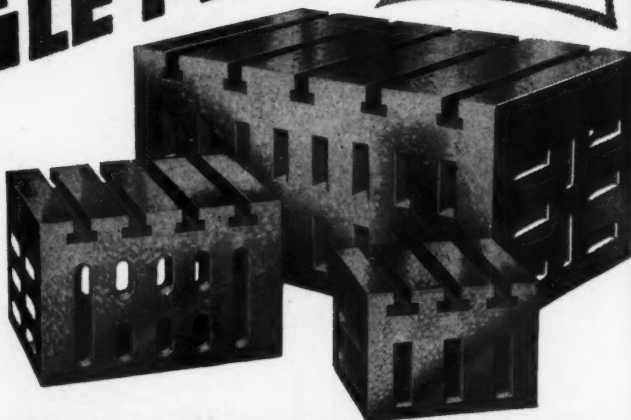
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PRODUCT



These box angle plates are grade "A" with a guaranteed accuracy of 0.0002 in. per foot, flat and square. They are manufactured in high duty cast iron with cored slots and machined "T" slots.

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MINOR INDEXING ATTACHMENT



... Standard index plate of 12 divisions. Special plates up to 20 divisions. Supplied with collet mounting and interchangeable 5½ in. table. Standard collets ¼ in. to ¾ in. by ⅜ in. dia., specials on request. Can be locked in any position. LARGER ATTACHMENT ALSO AVAILABLE.

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PRECISION
SURFACE
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FOR BENCH MOUNTING ALSO
FLOOR M/c WITH COOLANT

NEW DOUBLE COLUMN
CONSTRUCTION

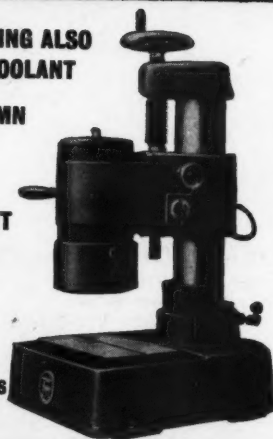
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12" × 6" × 10" HEIGHT

7" WHEEL—2½ H.P.

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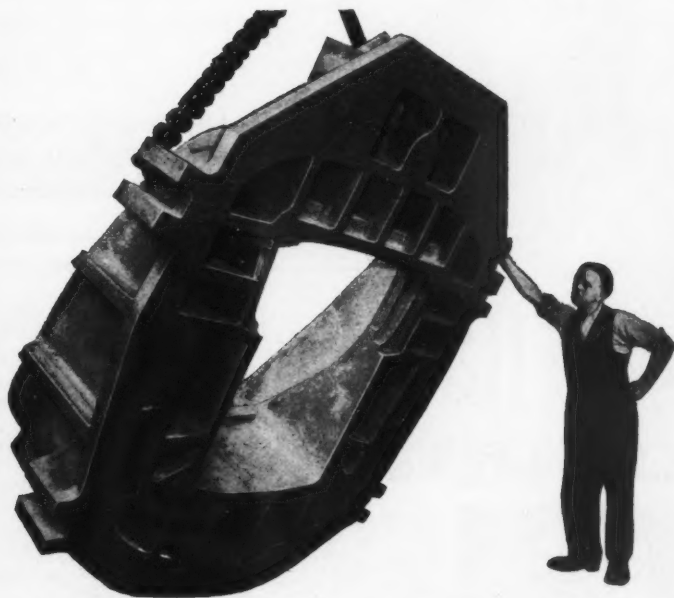
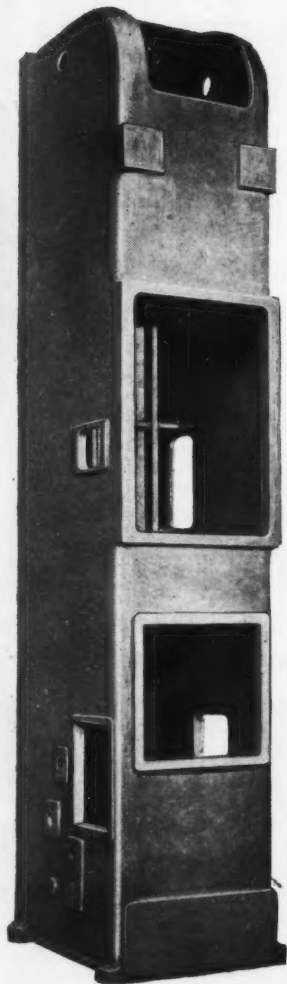
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High duty castings at the right price!

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left: machine column; weight 2 tons 7 cwt
height 11 feet

right: press tool casting;
weight 8 tons 2 cwt

Incanite

the special process cast iron

THE INCANDESCENT HEAT CO. LTD.
SMETHWICK - ENGLAND

9/8C/60

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SURFACE GRINDERS

for wet or dry grinding

DRY GRINDERS: IN CAPACITIES

12" x 6", 15" x 6"
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and 24" x 8"

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12" x 5", 18" x 5"
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- Rigid one piece Table with full length slideways.
- Smooth Table operation by Helical Pinion.
- Precision Grinding Head, with sturdy hardened spindle.
- Neoprene telescopic slideway covers fitted standard.

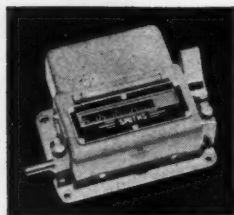
● Prices from £195.

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you can count on **SMITHS** to last... and last

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ZINC B.S. 1004 OR ALUMINIUM
LARGE OR SMALL

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UNIVERSAL TRIGRINDING MACHINE

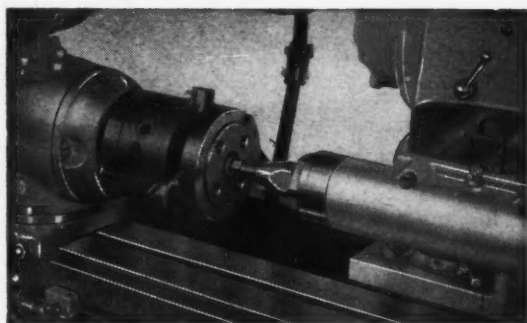
MODEL No. 810

**EXTERNAL, INTERNAL AND
SURFACE GRINDING**

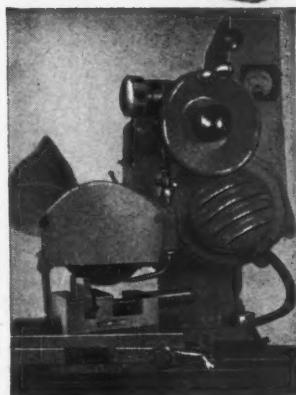
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**ONE MACHINE!
TO MICRO-INCH FINISHES**

- WORK SIZE UP TO 8in. DIA. AND SPEEDS UP TO 43,000 R.P.M.
- REVERSIBLE AND DOUBLE ENDED HEADSTOCK
- ALL SPEEDS INFINITELY VARIABLE
- VISUAL SPEED INDICATORS
- ANGLE INDICATOR GAUGE
- .0001in. DOWNFEED
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The machine can be rapidly adapted for internal grinding as shown.



Toolroom or production surface grinding can easily be carried out to precise limits.

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9 out of 11 minutes saved !

S.P.K. Fixed Centre Geared Multi-head fitted to 28in. Vertical Drilling machine using fixture fitted to standard S.P.K. Indexing Table.

Old time, using single spindle drills.....11 mins. 29 secs.

New time, using S.P.K. equipment.....2 mins. 5 secs.

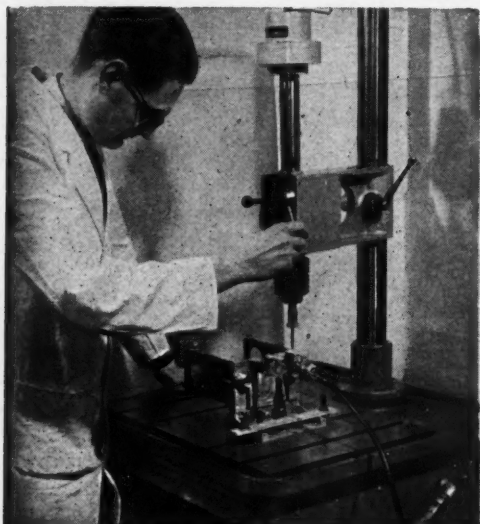
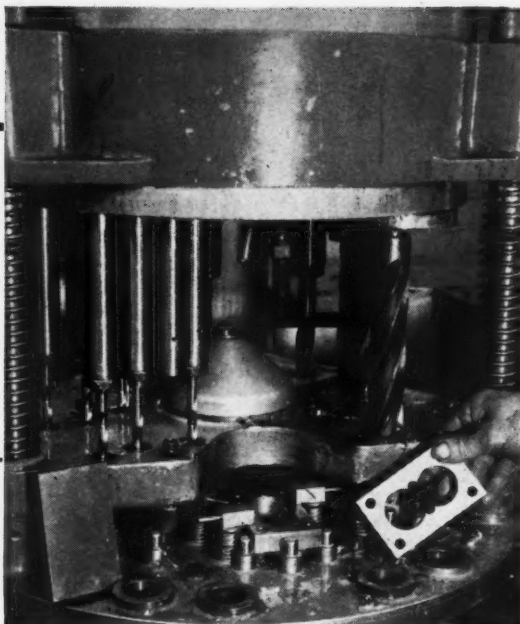
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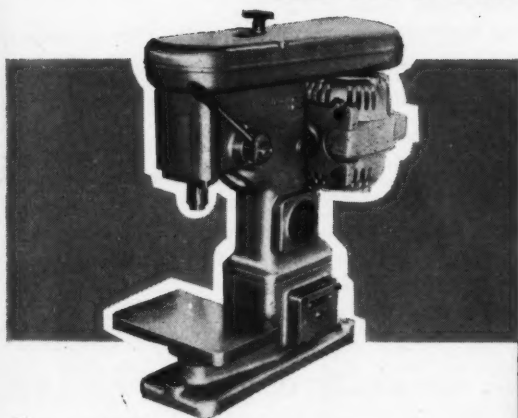
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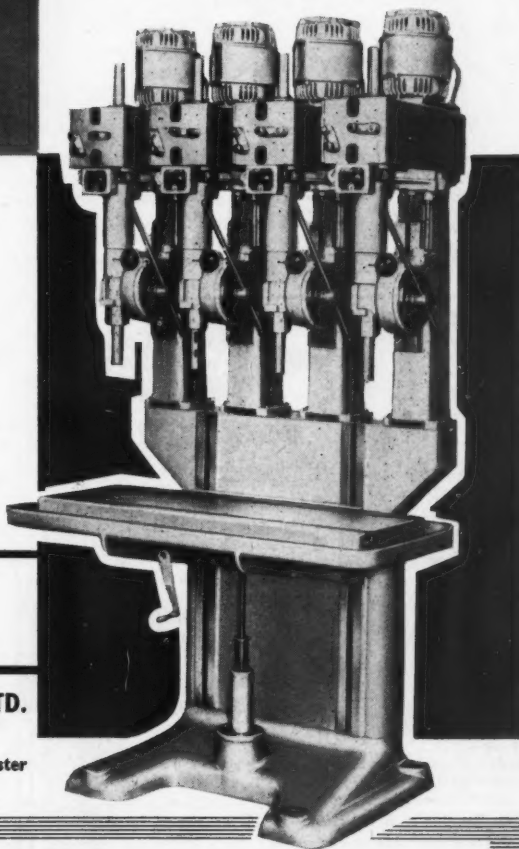
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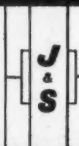
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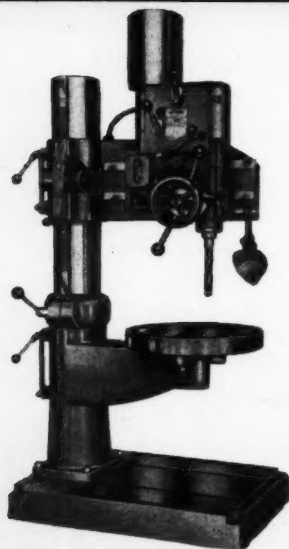
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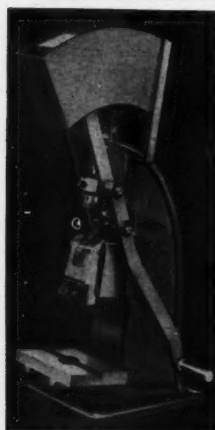
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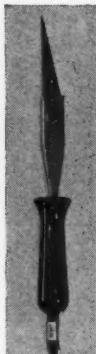
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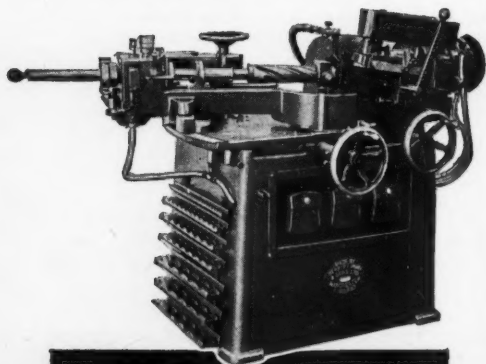
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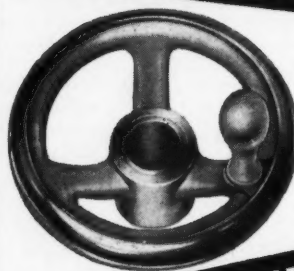
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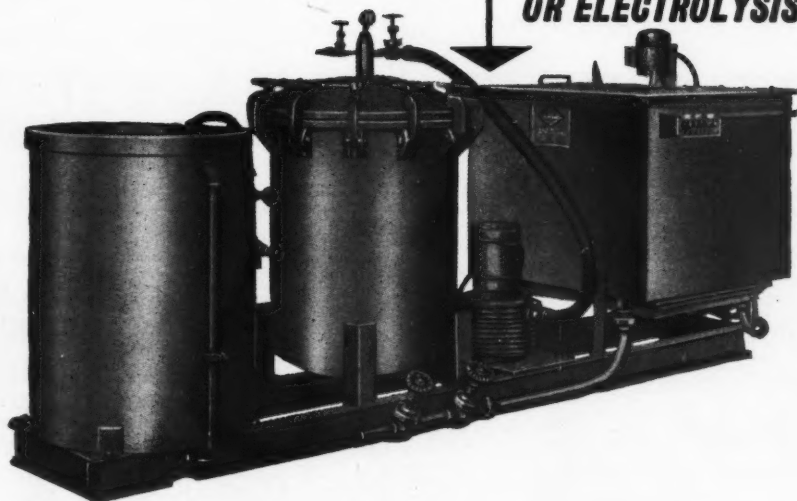
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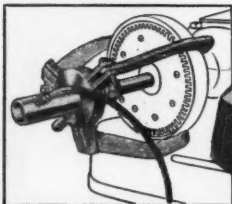
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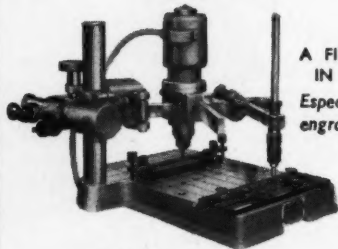
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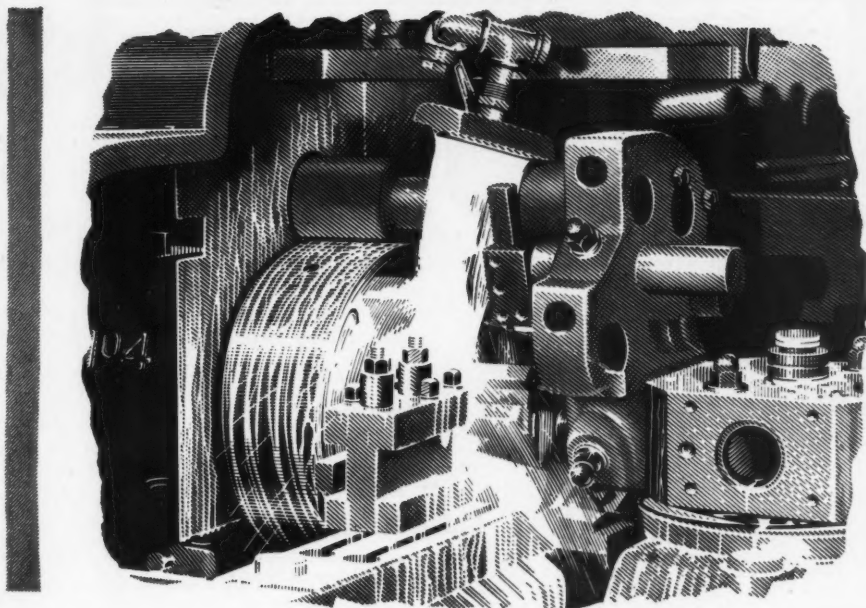
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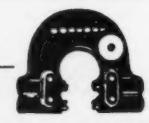
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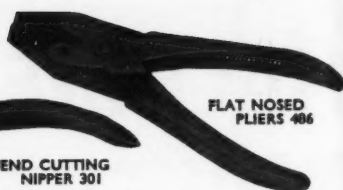
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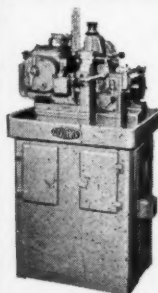
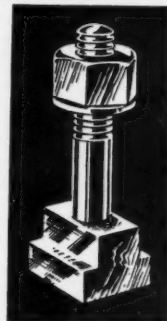
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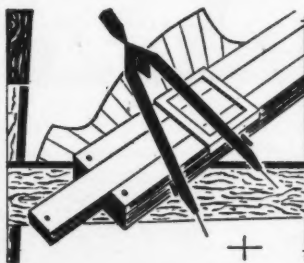
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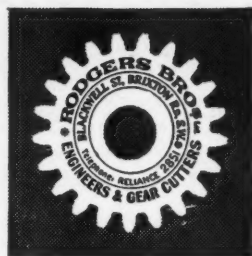


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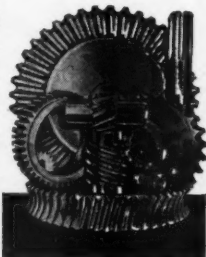
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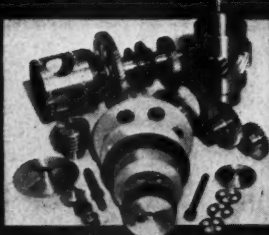
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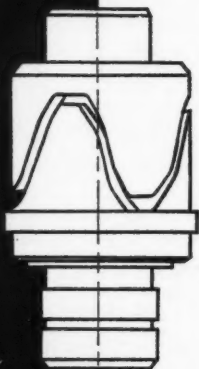
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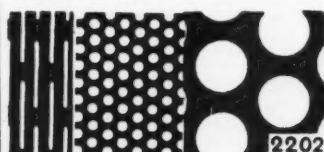
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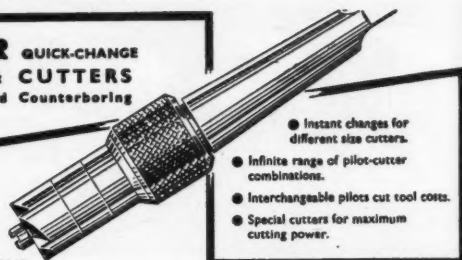
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Can You (A) Rebuild to Precision
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"Electric Upsetter for Foundry and Forge"
capable of manipulation of Steel Bars/
Sections 1 1/2 in. dia. to 2 in. dia. Maximum
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Modern Good Class Machine

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Modern 36in. or 42in. Centrifugal

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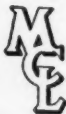
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Urgently****Late Type Machine Tools**

Best Prices are offered for
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Send us details of what you
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Immediate inspection.—ALBERT EDWARDS
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We pay cash for single machines
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Vertical Borer

Two **HERBERT No. 4 Senior**
Capstan Lathes

Three 4-spindle Drilling Machines
with power feed to all
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Preferably Herbert.

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All types of modern
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A/C/DC Electric Motors, Genera-
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One Asquith 20in. Two Spindle
Profiling Machine. Table size 18in. x
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Accura lathe 6in. motorized screw cutting ...	£50.0.0
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Maxicut No. 0 Multi Tool Lathe.
Cap. 6in. x 12in. Hyd. feed to slides and
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Birmingham 19. Northern 1234/5.**

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HUNDREDS of
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at the

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Wickman Moulton Thread Mil-
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7 1/2in. Internal, 6in. external. Motorised.—
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Herbert 9B Combination Turret
Lathe with equipment—condition good.
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FACEPLATE LATHE, 80in. swing.
RICHARDS No. 1 and 4 Horiz. Boring.
**RICHARDS 5ft. Double Column Vertical
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HAVE AVAILABLE FOR EARLY DELIVERY

One NEWALL 2436 Jig Borer, fully rebuilt and carrying maker's guarantees.

One NEWALL No. 0 Jig Borer, fully rebuilt and carrying maker's guarantees.

Capacity: 18in. by 12in. Table 14in. Spindle Nose to top of table

One NEWALL 'L1' Internal Grinding Machine, 10in. by 24in. fully rebuilt and carrying maker's guarantees. Maximum Grinding Depth: 12in.

One NEWALL No. 1 Jig Borer, fully rebuilt and carrying maker's guarantees.

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THE
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Telephone: Peterborough 67116/7

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American First Class Machines of all types can be supplied from our American Showrooms. Send your enquiries to K & C MACHINERY, LTD., Stephen Street, Coventry. Telephone: Coventry 23669.

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Kitchen & Wade H3 Horizontal Boring and Drilling Machine complete with Indexing Table.

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CONOMATIC 14in. 5 spindle. Type W.W. WICKMAN 11in. 5 spindle. 1941 machine. WICKMAN 11in. 5 spindle. 1941 machine. WICKMAN 6in. 5 spindle Chucker.

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ASQUITH 4ft. 6in. O.D.1 Radial Drill. ASQUITH 4ft. O.D.1 Radial Drill. PROGRESS 5E. Round table.

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Model 61 FELLOWS Gear Shaper. Straight spur, 35in. dia. x 5in. face width.

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WARNER & SWASEY No. 2A Long Bed. SOUTHBEND 16in. EDGWICK 7in. DEAN, SMITH & GRACE. Height of MONARCH 22M S.S. Taper Turning Lathe. WARD 10 Combination Turret Lathe.

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20in. ARCHDALE Plain Mill. Rapid. 28in. ARCHDALE Rapid All Ways. 18in. EDGWICK Production Mill. CINCINNATI No. 5 High Power Plain Hor. 1942 machine.

KENDALL & GENT C.V.M.40. KENDALL & GENT C.V.M.25 Vertical Mill.

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EDWARDS 6ft. x 14in. Overcrank. EDWARDS 8ft. x 14in. Overcrank.

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All machines motorised 400-440/3/50.

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A Good Number of High-class Machine Tools always in stock. At ELLISON (SALFORD) LTD., Cook Street, off Chapel Street, Salford 3, Lancs.

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C.V.A. No. 26. 1960 Machine. C.V.A. No. 12. 1960 Machine. C.V.A. No. 8. 1950. B.S.A. 7in.

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Broadbent 14in. x 7ft. unused. Sigmatic 14in. x 27in. Hyd. Lathe. 1960. D.S. & G. 18in. x 12ft. S. & S. Betts Bridgeford 15in. x 18ft. Lang 6in. x 3ft. S.S. & S.C. Holbrook 6in. x 4ft. Gap bed.

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HERBERT SMALLPEICE 6in. x 24in. Multi-tool.

MURAD 4in. x 24in. AGH Lathe. £125.

WARD No. 7 Capstan B/F, B/C.

O.V.A. No. 8 Automatic.

HARRISON 4 1/2in. x 42in. G.B. Full equip.

HOGARTH 6in. x 32in. S. & S. Lathe. £125.

PITTLER Turret Lathe, 2 1/2in. cap. £95.

RIVET Instrument Lathe, 4 1/2in. x 24in.

SPRINGFIELD 14in. Swing F. & B. Lathe. £225.

MILLERS (Vert. and Horiz.)

CENTRO No. 3H Auto-cycle, pro mill.

CINCINNATI 2MH, 53in. x 11in.

HEY Duplex Spline Mill. £175.

ADDOCK & SHIPLEY 1VM Vert. 25in. x 7in. As new.

HARDINGE 24in. x 6in. Prec. Auto feed. £165

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6ft. x 16 s.w.g. **CHICAGO** Folder. £150.

6ft. x 6 s.w.g. **EDWARDS**, high lift. £150.

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SMITH 10 ton Power Press. £175.

E.M.G. 9-ton Airdraulic. £200.

KENNEDY 2in. Tube Bender. £85.

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MISCELLANEOUS

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PFAUTER R.S.2 40in. dia. Hobber

THIEL Filing and Sawing Machine. £95.

HURTH Key Seating Machine. £225.

THIEL Punch Shaper.

ORMEROD 12in. Shaper with Cam Cutting Attach.

TMA Engraver with type.

AEROGRAPH Twin Cylinder comp. 100 p.s.i.

MATHEY Jig Borer with clocks. As new.

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18 Spindle Speeds 17-600 r.p.m. Excellent
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For forming an eye in the end of rods or bars from 1/2in. to 1in. diameter. By Williams, White & Co., U.S.A. Size No. 22. Weight about 20 cwt.—Photo, etc., from F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham 3.

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 6 spindle.

BULLARD Multi-Au-Matic 12in. 6 spindle.

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KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.

ROGOO Model AL55D Horizontal Boring and Facing Machine, 24in. dia. travelling spindle. (NEW.)

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RICHARDS Type PRT Horizontal Floor Boring Machine, 3 1/2in. travelling spindle, 28in. diameter facing head.

GIDDINGS & LEWIS No. 45 Horizontal Boring Machine, 5in. diameter travelling spindle.

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DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.

GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing x 18in. between centres.

LANDIS Plain Hydraulic Cylindrical Grinding Machine, 18in. swing x 72in. between centres.

ORCUTT Model BM24 Internal Spur Gear Grinding Machine.

CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing x 72in. between centres.

BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing x 36in. between centres.

MILLING MACHINES

CINCINNATI No. 3 High Speed Dial Type Vertical Milling Machine (1950).

CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 9 1/2in. x 22in. (1952).

CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. x 10in.

CINCINNATI No. 1M Vertical Milling Machine.

CINCINNATI No. 4 Dial Type Horizontal Milling Machine.

GRAFFENSTADEN Model F1101 Plain Horizontal Milling Machine, table 52in. x 10in.

FRATT & WHITNEY Model H1-3620 3-spindle "Keller" Die Sinking Machine.

CENTEC Model 3R Automatic Production Milling Machine, table 25in. x 16in.

MISCELLANEOUS

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TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED,

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Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: "Dynamo Yate."

London Office: Terminal House, Grosvenor Gardens, S.W.1. Tel.: Sloane 8206.
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All machines self-contained drive. 400/440 volts, 3 phase, 50 cycles.

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WEBSTER & BENNETT 4ft. D Type Vertical Borer.

BANDSAWS

THIEL No. 17 Metal Bandsaw.

CROPPING MACHINES

Angle Cropping Machine. Cap. up to 6in. x 1/2in. angles.

DRILLING MACHINES

POLLARD 13in. Pillar Drill. No. 2 Morse Taper. R. & F. Table 11in. x 11in.
ARCHDALE 28in. Heavy Duty Pillar Drill. No. 4 Morse Taper.

GRINDING MACHINES

NEW NORTON 10in., 12in., 14in., 16in. and 20in. D/E Tool Grinders.

ABRASIVE 3B 24in. x 8in. Vertical Spindle Surface Grinder.

CAPSTAN AND CENTRE LATHES

LANG 8 1/2in. x 4ft. 0in. S.S. & S.C. Lathe.

HAMMERS

MASSEY 5 cwt. Slide Type Pneumatic Hammer. 400/3/50.

MILLING MACHINES

RICHMOND H.2 Horiz. Miller. Table 35in. x 9in.

VAN NORMAN No. 26 Horizontal and Vertical Milling Machine. Slotting head.

MILWAUKEE 3.H Vertical Milling Machine.

PRESSES

TAYLOR & CHALLEN 845 Dial Feed Notching Press.

BRADLEY & TURTON No. 3 Flypress.

SWEENEY & BLOCKSIDE Bench Press. Capacity 3 tons.

SCREWING MACHINES

KENDALL & GENT 3in. Screwing Machine. Leadscrew type.

POLISHING MACHINES

3 and 5 h.p. Double Ended Polishing Spindles.

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ORMEROD 12in. Stroke Slotting Machine.

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JONES & SHIPMAN 30in. Vertical Drilling Machine. No. 4 Morse Taper. Power feed. 400/3/50.

KEARNS No. 2 Standard Horizontal Boring Machine with facing head and sliding spindle. 400/3/50.

SNOW 720 Table Surface Grinding Machine.

ARCHDALE 28in. Horizontal Manufacturing Milling Machine, with power and rapid feeds. Table size 40in. x 30in. 400/3/50.

WE UNDERTAKE REBUILDING OF ALL TYPES OF MACHINE TOOLS

CENTAUR TOOL WORKS, EYRE STREET, SPRING HILL, BIRMINGHAM, 18.

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Hazelwood & Dent 12 1/2in. Motorised Spinning Lathe for sale. Between centres 30in. With compound handwheel operated rest and trimming head. 3-speed drive. Motor drive for 400-440/3/50.—F. J. EDWARDS LIMITED, 359, Euston Road, London, N.W.1, or 41, Water Street, Birmingham, 3.

Huller UG3 Tapping Machine, 1955. 400/3/50.—BOX C902, MACHINERY, Clifton House, Euston Road, N.W.1.

Dean, Smith & Grace Lathe, 9in. height x 36in. between centres. 2in. dia. spindle bore. 1 h.p. 490 r.p.m. 5 h.p. motor 400-440/3/50.—BOX C905, MACHINERY, Clifton House, Euston Road, N.W.1.

Herbert Carbicut Lathe, 16 spindle speeds 445 to 3,025 r.p.m. 3 feed changes 70, 105, 140. 1 1/2in. dia. spindle bore. 5 h.p. motor. 400-440/3/50.—BOX C910, MACHINERY, Clifton House, Euston Road, N.W.1.

Libby 4R Turret Lathe, 12 spindle speeds 27 to 725 r.p.m. Power traverse to saddle and turret. With 10in. 3-jaw chuck, fourway toolpost, 2 piloted multi-knee toolholders, 4 small extensions, auto pump. 400/3/50.—BOX C916, MACHINERY, Clifton House, Euston Road, N.W.1.

6in. RPA 8 Spindle Gridley Chucking Auto complete with Chucks, Cams, Tool Slide Holders, etc. Fully motorised. Excellent condition.

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BROWN & SHARPE No. 2 Surface Grinder.

STUDER Model PSM.150 Profile Grinder. This machine is in excellent condition.

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BROWN & SHARPE No. 13 Universal Grinder.

BRYANT No. 5 Heavy Duty Internal Grinder.

BENTLEY Form Cutter Grinder.

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BOYES & EMMS S.S. & S.C. Lathe, centre height 16in. x 7ft. 6in.

ROLLO 6 1/2in. Centre Lathe.

SWIFT Hydraulic Copying Lathe, 36in. swing x 5ft. 6in. b.c., 30 h.p. drive.

HENDY 13in. x 30in. S.C. Lathe.

RENTY 4in. x 18in. b.c. Precision Lathe.

LE BLOND 14in. x 24in. S.C. Lathe.

BOLEY LEINEN L.4.2 Second Operation.

WARNER & SWASEY No. 3 Capstan

MILLERS

ARCHDALE 48in. Heavy Duty Automatic Horizontal Mill, speeds 38-313.

CINCINNATI 1-18 Production Miller.

KENDALL & GENT Vertical Miller, table 69in. x 19in., speeds 20-300, rapid traverses.

BROWN & SHARPE No. 2 Vertical Mill, table 54in. x 14in., speeds 30-1,200 r.p.m. Power down feed to head.

SCHIESS DEFRIES Vertical Keyseater.

MAMMUT 10in. x 23in. Table Horizontal Mill, hand lever operated.

FRITZ WERNER 10in. x 34in. Horizontal Mill.

BROWN & SHARPE No. 2 11in. x 49in. Horizontal Mill, speeds 15-376. Feeds 3/10-15 I.P.M.

PRESSES, SHAPERS, PLANERS AND HOBBERS

CHURCHILL-REDMAN 32in. Stroke Heavy Duty Shaper. Excellent condition.

ESSEX No. 32 Punch Shaper.

30-ton **RASKIN** Double Sided Double Geared Drawing Press. Area 20in. x 23in. Draw 4 1/2in.

MAXICUT High Speed Gear Shaper, max. dia. 7in. x 2in. face.

New **FOREBA** Model HDA.80 Planer, capacity 10in. x 23in. x 30in. table, drive by Heid gearbox.

DOWDING V8 Gear Hobber. Max. pitch in steel one cut 14 D.P.; in soft metals one cut 12 D.P. Max. dia. 0in.-8in.

No. of teeth cut 6-400. Length of hobbing traverse 7 1/2in. Hob spindle speeds (10) 61-246 r.p.m.

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BOLEY Multi Drill VB 10in.

CORONA 13in. 2AP Sensitive Pedestal Drill.

CORONA 20in. Pedestal Drill.

15HEF 4 Spindle Drill.

MISCELLANEOUS

CANNING Double Ended and Centreless Polishing Machines.

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MACHINERY

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(Suppt.) 187



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CHURCHILL 42 in. swing 120 in. bore internal

HEALD No. 81 Internal Gagematic Automatic Chuck Grinder. Serial Number 18601.

HEALD Internal Model 81

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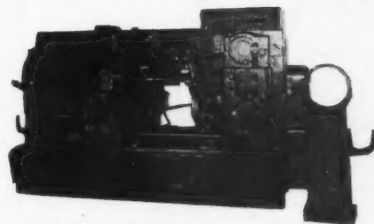
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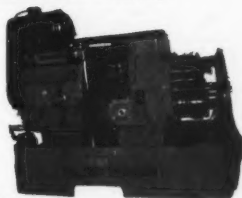
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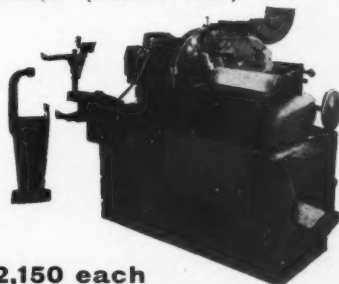
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CINCINNATI 34/36 Duplex Hydraulic Miller. Table 64in. by 16in. Hydraulic traverses 36in. with rack variator. 2-way cycle. Admits approx. 20in. between spindle. Hydraulic lift to heads. M.D. 400/3/50.

CARTER & WRIGHT No. 4 dual feed Keyseater. T-slotted table 38in. by 12in. Cuts keyways up to 30in. by 1in. M.D. 400/3/50.

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RHODES Motorised Double Geared Press Brake.

With east iron side frames, reinforced by nickel-chrome steel bars. Bed and top beam of steel plate. Direct geared motor drive for 400/3/50. Pressure exerted approx. 150 tons. Forming capacity 10ft. x 1/2in. or 18ft. x approx. 1in. Clear width between housings, 10ft. 2in. Weight approx. 20 tons.

FOUR BLACKBURN & CRAWSHA Rotary Shearing Machines. Motorised for 400/3/50 supply. Fitted with adjustable gauge. Capacity 1in. thickness. Cutters 5 1/2in. diameter x 1in. thickness. Cutting speed 5ft. 6in. per minute. Weight approx. 10 1/2 cwt.

CRAIG & DONALD Deep Cap Guillotine Shearing Machine. Motorised for 440/3/50 supply. With automatic hold-down and adjustable back gauge. Capacity 14ft. x 1in. Complete with three spare sets of blades. Weight approx. 11 tons.

BRADLEY & CRAVEN Geared Press Brake Motorised for 400-440/3/50 supply. Maximum pressure approx. 65 tons. Forming capacity 10ft. x 12 S.W.G. over die opening of 1in. or 8ft. x 1in. over die opening of 1 1/2in. Between frames 10 1/2in. Weight approx. 8 1/2 tons.

TAYLOR & CHALLEN Double Sided Double Action Cam Action Drawing Press. Can be supplied motorised for 400-440/3/50 supply. Punch stroke 3in. Blankholder stroke 4in. Between uprights 20in. Bed 18in. x 15 1/2in. Hole in bed 8in. diameter. Weight approx. 45 cwt.

BESCO Eccentric Power Punching Press. Motorised for 400-440/3/50 supply. Pressure exerted approx. 8 tons. Stroke adjustable from 1in. to 1 1/2in. Bed 11 1/2in. x 8 1/2in. Hole in bed 4 1/2in. x 3 1/2in. Weight approx. 750 lb.

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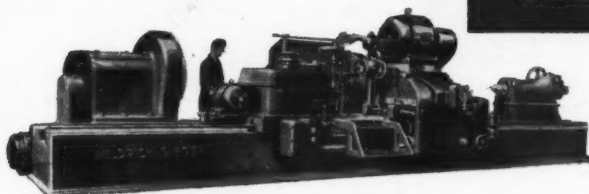
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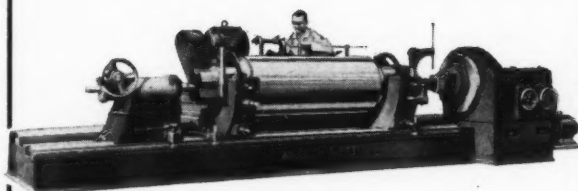
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8in. **LANG** S.S. & S.C. Lathe, 4ft. between centres.

New 7in. **WOODHOUSE & MITCHELL** Type 70 Junior Lathe.

20in. **ARCHDALE** Plain Milling Machine.

Power feeds and rapids.

6in. **HOLBROOK** Toolroom Lathe.

14in. **BUTLER** Slotting Machine. Circular table.

8in. **FABIUS** Lathe, 5ft. between centres. (New.)

Model HBY **CHURCHILL** Internal Grinder. No. 3 **KITCHEN & WADE** Vertical Honer.

27in. **WOTAN** Hydraulic Shaper.

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LATHES

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CARDIFF 9 1/2 in. x 4ft. b.c.
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BROADBENT 12 1/2 in. x 7ft. 6in.

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LATHES

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MISCELLANEOUS

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Cold Sawing Machine with fluid grip vice
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3 speeds, 5 h.p., 400/3/50.

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Machine. 4in. capacity. Finest pitch
cut 60. Spindle speeds 500-1,000-2,000
r.p.m. 400/3/50.

WILSON "Newel" 7 1/2in. Cent e Lathe.
S.S. & S.C. All Geared He. Quick
Change Gear Box. Distance between
centres 32in. 9 spindle speeds 26-477
r.p.m. Motorised 400/3/50. Machine com-
plete with 3-jaw chuck, faceplate, tra-
veling steady.

MILWAUKEE 1H Plain Horizontal Milling
Machine. Table working surface 40in. x
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ASQUITH E.C. 6ft. Girder Type Radial
Drilling Machine. Spindle Bored No. 5
M.T. 6 spindle speeds 220-905 r.p.m.
4 auto feeds. 400/3/50.

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Guillotine. Capacity 10ft. x 4in. m.s.
20 strokes per minute. Motorised 15 h.p.
400/3/50. Complete with automatic hold-
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and square pair of blades.

BROOKES Overcrank, Double Geared,
Power Guillotine. Capacity 4ft. x 4in.
Powered work table (in two sections),
24ft. long approx. x 4ft. wide. Motorised
20 h.p. 400/3/50.

RHODES No. 12 Double Side, Double
Crank, Geared, Power Press. Pressure
75 tons, fitted fixed stroke 4in. Bed
area 44in. x 42in. Motorised 400/3/50.

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MATHEYS Jig Boring Machine. Type
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Table 30in. x 9 1/2in. 230/1/50.

JONES & SHIPMAN No. 540 Surface
Grinder. Capacity 18in. by 6in., hydrau-
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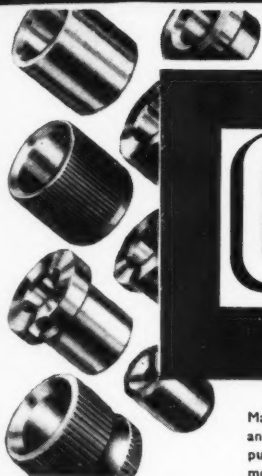
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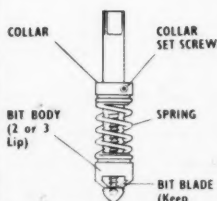
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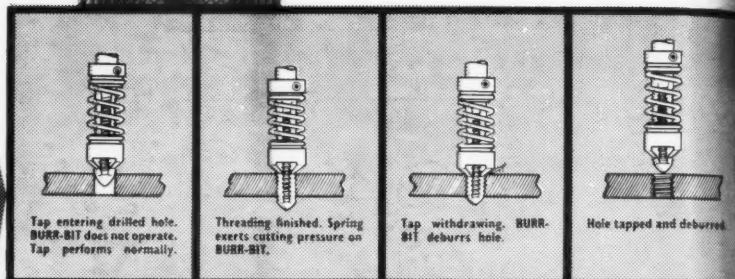


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